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The ***Athens Journal of Sports (AJSPO)*** is an Open Access quarterly double-blind peer reviewed journal and considers papers from all areas of sports and related sciences. Many of the papers published in this journal have been presented at the various conferences sponsored by the Sport, Exercise, & Kinesiology Unit of the **Athens Institute for Education and Research (ATINER)** & the Panhellenic Association of Sports Economists and Managers (PASEM). All papers are subject to ATINER's Publication Ethical Policy and Statement.

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The current issue is the first of the nineth volume of the *Athens Journal of Sports*, published by the Sport, Exercise, & Kinesiology Unit of the ATINER under the aegis of the Panhellenic Association of Sports Economists and Managers (PASEM).

Gregory T. Papanikos, President, ATINER.

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- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **11 April 2022**

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- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **27 June 2022**

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Dr. Maria Konstantaki, Academic Member, ATINER & Senior Lecturer, Buckinghamshire New University, UK.

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No Home Bias in Ghost Games

By Alexander Dilger[*] & Lars Vischer[±]

Because of the COVID-19-pandemic the men's first German football league (Bundesliga) had to take a break before it was permitted to finish the season 2019/20. However, only ghost games without spectators in the stadiums were allowed in this finishing phase. Comparing these 83 games without spectators with the corresponding 83 regular games between the same teams with spectators before, we find that the normal advantage for the home team disappears. There were 48.2% home wins with spectators and only 32.5% without. This decrease is statistically significant. There were 32.5% away wins before the break and 44.6% thereafter, while the draws increased from 19.3% to 22.9%. However, these increases are not statistically significant. One reason for the lost home advantage is the disappearance of a home bias by the referees, who gave significantly less extra time and also less yellow and red cards to the away team.

Keywords: *Bundesliga, COVID-19, football, ghost games, home bias*

Introduction

Ernst Happel once said "a day without football is a lost day" (Deutscher Fußball-Bund 1999, p. 456). The COVID-19 pandemic has had a massive impact on the professional sports industry, in addition to broad social restrictions, and has led to unplanned days without football. As a result, the first German football league (Bundesliga) of men was temporarily suspended on 16 March 2020 and reopened on 16 May 2020 as the first major sports league to do so with significant restrictions (Deutscher Fußball-Bund 2020). The most striking restriction was the exclusion of the public in the stadium. The fact that the current 2019/20 season was interrupted and then resumed with the same team compositions opens up unique research opportunities.

In particular, the influence of the spectators on the outcome of the game can be investigated. Home bias is considered to be one of the best documented phenomena across all sports (e.g., Courneya and Carron 1992, Pollard and Gómez 2014, Pollard and Pollard 2005). A relative advantage exists if the probability of winning a home game is higher than that of losing. Although the home bias diminishes over the years (Biermann 2011, pp. 79-82) and may vary from league to league, it is not to be dismissed. Only the reasons for the home bias are discussed such as the journey of the away team, the familiarity of the home ground, the influence of the spectators, the tactical orientations or the refereeing behaviour (Pollard 2008, Sutter and Kocher 2004). The unique experiment, which was carried out involuntarily, in the season that finished on 27 June 2020 enables to

[*]Professor, University of Münster, Germany.
[±]Research Associate and Doctoral Student, University of Münster, Germany.

concentrate on the spectators as the object of research.

In contrast to a study already conducted on ghost games by Reade et al. (2021), the ghost games in this season are neither individual cases in different competitions nor spread over several years nor the result of a punishment leading to spectator exclusion. Teams with relatively equal playing strength in the same competition can be compared first with and then without spectators. Certainly, factors that cannot be considered in this paper play a role, too, such as the return of injured key players through the COVID-19 break, while others were suspended after positive virus tests, different incentives at the end of the season by fixed table positions, differences in the game schedule before and after the break as well as different preparations in the lockdown. However, despite these limitations, there has never been such comparability of matches with and without spectators.

Due to the almost identical conditions, we have therefore decided to examine the home bias only in the 2019/20 season for the first German football league and to compare the 83 ghost games with just the 83 (of 223) matches with spectators between the same teams before. In addition to the final results of the games, we collected various variables.

In the following, we discuss the literature relevant to this topic in the next section, form hypotheses based on the literature in the following section, describe the data we have collected, analyse these data, discuss the results and conclude with an outlook.

Literature Review

Initial research on the home bias is by Schwartz and Barsky (1977), reporting that this bias existed in selected American team sports over long periods of time. Biermann (2011) speaks of an existing home advantage but one that dwindles over time, based on the results of a study by Palacios-Huerta (2004) of English football. Between 1888 and 1915 the home advantage was 56.6% and between 1983 and 1996 it was only 47.4% (Palacios-Huerta 2004). Biermann (2011) attributes this to the increasing professionalization of football as well as the differentiable economic possibilities of the clubs and the resulting performance. Specifically for the first German Bundesliga, Strauß and Höfer (2001) determined a distribution of 53.3% victorious matches of the home team from the 1963/64 to the 1997/98 season compared to 26.0% draws and 20.7% away wins.

In the literature several reasons are discussed for the home bias. Schwartz and Barsky (1977) mention the journey of the away team, the familiarity of the environment (see also Loughhead et al. 2003, Moore and Brylinsky 1995) and the spectators. Courneya and Carron (1992) add competition rules to these factors and Wallace et al. (2005) append refereeing behaviour (see also Sutter and Kocher, 2004). The tactical orientation of the teams can play a role, too. There are also differences between countries (Pollard 2006).

The factor of travel in the first investigations seems more questionable now in view of the ever increasing professionalization of the teams and the rising convenience of travel. Accordingly, Clarke and Norman (1995) have found

already in the 1990s that travel factors no longer played a practical role in determining the home advantage. Competition rules are more likely to be important in other sports, whereas in football they seem to favour the home team only in tournaments such as world championships where the home team usually does not have to expect very tough opponents in its group (Strauß and MacMahon 2019) or is automatically qualified for the group stage. The familiarity of the playing ground should not play a major role in the outcome of the game, too, given that the conditions on the fields and their surroundings, such as the booths and benches are now almost identical for the professional teams.

The influence of the spectators remains as a potentially important factor. The same is true for the refereeing decisions that seem to be more benign when the home team commits fouls compared to away teams (Sapp et al. 2018). Frondel and Schubert (2016) find a correlation between the card spread and a decreasing chance of winning. Moreover, there could be interactions between the audience (including its noise) and the number of fouls as well as the cards and the resulting standard possibilities, e.g., penalties and free kicks (Nevill et al. 2002). Another result could be inhibitions in duels of a player already cautioned (Nevill and Holder 1999). Dohmen (2008) finds that referees tend to give more extra time when the home team only needs one goal to win. If the home team is already ahead, less extra time is given, which could also be influenced by the spectators. Riedl et al. (2015) confirm this and determined a longer extra time of on average 18 seconds. Better referee training over time could be a reason for the declining home advantage over recent years (Nevill et al. 2013). However, it has not been determined as yet whether influencing referees has a causal influence on the home advantage.

Tactical play is also influenced by the location. In home games, players are more effective in offensive actions and less inclined to take defensive actions due to support from the ranks (Schwartz and Barsky 1977) since teams want to win in front of home crowds and offensive play is conducive to the achievement of this goal (Carmichael and Thomas 2005). Furthermore, the audience itself has a direct impact on the players. For example, the volume of the audience is perceived in a negative way to be louder by away teams than by home teams (Barnard et al. 2011). Furthermore, players have higher self-confidence and conviction before home matches and less fear of the game (Bray et al. 2002). This could become a self-fulfilling prophecy. Athletes go into a home or away game with different expectations (Fothergill et al. 2012, Jurkovac 1985). When teams perceive a home advantage or an away disadvantage, their performances may differ even if no (other) advantage or disadvantage exists (Strauß and MacMahon 2019). Home teams have also higher resistance forces, e.g., by measuring the level of testosterone, seeing the away teams as intruders into their territory (Carre et al. 2006).

Reade et al. (2021) analyse 160 European ghost matches and thirty-three thousand matches with spectators in various national and international competitions from the 2002/03 season until April 2020, just before the ghost games analysed by us. They found that 36% of home matches were won in empty stadiums compared to 46% of home matches in full stadiums. Taking into account the strength of the

teams, this difference is not statistically significant. Most of these matches were played as ghost games because misconduct by one of the teams or its fans took place before. Furthermore, they show that differences in refereeing behaviour could be observed. Away teams generally received more yellow cards than home teams but in matches without an audience this difference was significantly lower.

Now there are several studies analysing ghost games because of COVID-19 as we do. Fischer and Haucap (2021) examine the first three leagues in Germany. They find a decline in the home advantage in the first league but no significant change in the second and third league by ghost games. Their main explanation is the reduction in the number of spectators that is higher in the first league. Other relevant factors in their investigation are tracks in the stadium, the travel distance, derbies and matches within the week. McCarrick et al. (2021) examine the change of the home bias in ghost matches in 15 different leagues from the 2019/2020 season and find that referees distribute fewer punitive sanctions against the away team and that the home team's performance decreases.

Bryson et al. (2021) analyse 1,498 ghost games and argue that the absence of a biased home crowd has no effect on the final outcome of these games. However, they find a reduction in yellow cards for away teams compared to home teams by a third. Endrich and Gesche (2020) also find that the disadvantage of away teams regarding yellow cards and given fouls is reduced in games without spectators in the first and second German league. Similarly, Cueva (2020), using data from 41 professional leagues in 30 countries, demonstrates that the disadvantage to away teams in terms of card allocation decreases during the period of spectator exclusion. Sors et al. (2021) show that spectators can influence the referee and consequently the outcome of the game. Scoppa (2021) studies top European leagues and finds a decrease in the home advantage in various performance measures and in decisions on fouls, cards and penalties. Cross and Uhrig (2020) show for the top 4 leagues in Europe (Premier League, Bundesliga, Serie A and La Liga) a disappearance of the home bias using the indicator home goals minus away goals. Correia-Oliveira and Andrade-Souza (2021) also find that there is an effect on the home bias in the 2019/2020 season. Moreover, Hill and Van Yperen (2021) find a significant change in the home bias in Germany. These results are also observed by Tilp and Thaller (2020). However, Wunderlich et al. (2021) do not find a significant decrease in the home bias in their study of professional and amateur matches.

Ferraresi and Gucciardi (2020) choose another perspective and find different changes of the home bias for teams with different performance levels and spectator numbers. In contrast, Sánchez and Lavín (2021) do not find any significant differences in the distribution of wins, draws and losses, with the exception of the German and Spanish top leagues. Nevertheless, statistically insignificant tendencies in this respect are recognisable in other leagues as well. An absence of the spectators can also have major economic or financial consequences, as Drewes et al. (2021) show. Finally, a disappearance of the home bias can also be observed in other sports. Ehrlich and Ghimire (2020) use data from the first American baseball league and observe a disappearance of home bias, too.

Hypotheses

On the basis of the literature review and our own considerations, we formulate three hypotheses that can be tested empirically. As shown in the last section, the home advantage can depend on various factors, with spectators usually being the main factor. So our first hypothesis is (in accordance with Reade et al. 2021, and Fischer and Haucap 2021):

1) The home bias disappears in ghost games.

Further we try to examine the influence of the spectators not only directly on the result but also on parameters influencing this result. As explained in the previous section, the referee plays a role in the outcome of the game by giving yellow and red cards and deciding about extra time. At the same time, the performance of the referee is influenced by the presence of spectators leading to our second hypothesis:

2) The referee's decisions no longer benefit the home team without spectators.

The teams' performance plays the main role in the outcome, so we survey various performance parameters like distance run in km, passes accuracy, possession, tackles won and shots needed to score a goal to test our third hypothesis:

3) The performance of the home teams becomes weaker without spectators and at the same time that of the away team becomes stronger.

Data

There were 306 matches in Germany's first football league (of men) in the season 2019/20. The first 223 games were played under normal conditions with spectators. These were mainly the matches of the match days 1 to 25. Only two matches of these match days took place later without spectators. One was the game between Borussia Mönchengladbach and the FC Köln of the 21st match day, which was played on 11 March 2020 immediately before the break by COVID-19 because it was cancelled on the original date due to a storm warning by the German Weather Service and resulting safety concerns. The other match between Werder Bremen and Eintracht Frankfurt of the 24th match day was initially delayed only shortly due to a tight schedule because of Eintracht Frankfurt's participation in the Europa League, but was postponed longer to 3 June 2020 due to the COVID-19 break. From 16 August 2019 to 8 March 2020 Bundesliga matches were played under regular conditions. The matches continued on 16 May 2020 with the 26th match day. From that date until the 34th match day on 27 June 2020, all matches were played with spectators excluded. Together with the two matches mentioned above, 83 matches were played without spectators. Our observation period is therefore exactly one football season. Furthermore, only

Bundesliga matches are taken into account and not matches of other competitions like German cup games or the Champions League, as these competitions have their own dynamics and teams from different leagues participate.

We have collected various data for the match days. For the question of the extent of the home bias during the current Bundesliga season, we recorded the final results for goals scored and the distribution of home wins, draws and away wins. Further indicators of the teams' playing style are the number of scored goals, the distance run in kilometres, the passes accuracy, the ball possession, the tackles won and the fouls committed. The fouls committed are just as decisive for the assessment of the referee's behaviour as the cards dealt to each team. We only consider cards for players, not those for officials. Furthermore, we just count the number of cards, not the reasons such as fouls, complaints or taking off the jersey after scoring a goal. The score in the 90th minute and the given extra time also play a decisive role in assessing the behaviour of the referee. For the extra time, the actual extra time and not the displayed extra time was used as these can sometimes vary considerably and the referee can especially influence the former. We have collected all data relevant to our research with one exception from kicker.de, the homepage of the leading football magazine in Germany.

The exception is the data on market values that we have collected at transfermarkt.de for different moments in time. This seems necessary to evaluate whether a possible disappearing home advantage in the ghost games is merely due to a random distribution of the better teams as away teams. Therefore, it makes sense to choose different points in time to collect these data to take into account the changes in the strengths of the teams during the period and possible transfer activities. This appears to be a better indicator than the table position because the results to be investigated are directly fed into the table. Accordingly, we have chosen the value of the teams on transfermarket.de on 15 August 2019 for match days 1 to 7. From match day 8 to the end of the first half, the 17th match day, we have taken the values on 15 October 2019. The team values on 15 January 2020 are the reference values for match days 18 to 25, the last match day before the COVID-19 break. Major changes are expected at this value due to the transfer phase in winter. The transfer values from the restart of the league on 16 May 2020 are taken for the match days 26 to 34. They are lower than before the Corona break due to the changed financial possibilities of the clubs but only the relative values of playing teams are relevant for us.

Empirical Results

We examine the data of the season 2019/20 regarding differences between matches played under normal conditions and ghost games. First we look at descriptive statistics, then use various statistical test procedures, and finally present results of regression models.

Descriptive Statistics

We investigated the entire season as well as only the mirrored games together with the ghost games. The latter reduces the data set of matches under regular conditions (RG) from 223 to 83 but has the advantage that the same teams play against each other and matches between other teams are not considered. Accordingly, the results are somewhat stronger (but similar to those with all games of the season, which are available upon request). Table 1 shows a comparison of the descriptive statistics of the 83 games under regular conditions and the 83 ghost games (GG) without spectators.

Looking at Table 1, a decline in home wins from 48.2% before the COVID-19 break to 32.5% home wins after the break can be observed. (This is similar to the 45.3% of home wins on average in the ten seasons before, from 2009/10 to 2018/19. In these ten seasons, away wins occurred in 30.1% of matches on average and draws accounted for the remaining 24.6%.) In combination with the draws, which increased from 19.3% to 22.9%, this results in on average 0.44 points less at home. The away wins increased from 32.5% to 44.6%. In addition, the difference in goals from the home team's point of view is reversed from a positive value of 0.433 to a negative value of -0.228. On a purely descriptive level, our first hypothesis could be confirmed but other tests are needed to establish this.

For the descriptive assessment of our second hypothesis that refereeing behaviour is less favourable to the home team in ghost games, we look at the overtime at the end of the game and the cards given to the teams. The extra time at the end of the game decreases from 3.734 to 3.228 minutes, which supports our hypothesis. The number of cards for the home team increases for ghost games and decreases for away teams. The variable "Cards difference (H-A)" shows this clearly by its negative value of -0.614 for regular games and its positive value of 0.144 for ghost games. This tendency is also visible when yellow and red cards are differentiated. For the home team, only the number of red cards is decreasing but the red cards for the away teams are decreasing more. All of this is in accordance with our second hypothesis.

Table 1. *Descriptive Statistics of the Season 2019/20*

	N		Minimum		Maximum		M		SD	
Variables	RG	GG	RG	GG	RG	GG	RG	GG	RG	GG
Home win	83	83	0	0	1	1	0.482	0.325	0.503	0.471
Draw	83	83	0	0	1	1	0.193	0.229	0.397	0.423
Away win	83	83	0	0	1	1	0.325	0.446	0.471	0.500
Home points	83	83	0	0	3	3	1.638	1.204	1.366	1.314
Away points	83	83	0	0	3	3	1.168	1.566	1.333	1.345
Diffpoints	83	83	-3	-3	3	3	0.469	-0.361	2.670	2.625
Market value in Mio. € (H)	83	83	27.600	26.530	882.650	756.580	262.570	228.199	219.123	195.097
Market value in Mio. € (A)	83	83	27.600	26.530	882.650	756.580	257.579	231.754	215.261	196.101
Market value difference (H-A)	83	83	-798.000	-716.130	846.650	687.800	4.991	-3.555	311.049	282.023
Goals (H)	83	83	0	0	8	6	1.855	1.433	1.466	1.390
Goals (A)	83	83	0	0	5	6	1.421	1.662	1.308	1.391
Goals difference (H-A)	83	83	-5	-5	8	5	0.433	-0.228	2.142	2.216
Extra time 2nd half (min)	83	83	0	0	10	7	3.734	3.228	1.994	1.727
Shots on target (H)	83	83	4	4	29	34	15.975	13.325	5.280	5.310
Shots on target (A)	83	83	2	4	24	26	11.879	11.831	4.715	4.520
Shots/goals (H)	83	83	0	0	29	22	7.644	6.081	6.259	5.455
Shots/goals (A)	83	83	0	0	24	18	6.035	5.946	5.737	4.670
Distance run in km (H)	83	83	104.100	105.380	127.950	126.390	116.579	115.198	4.368	4.691
Distance run in km (A)	83	83	103.640	105.740	129.350	124.210	116.108	115.185	5.061	4.411
Passes accuracy % (H)	83	83	64	65	94	89	78.554	79.674	6.453	6.165
Passes accuracy % (A)	83	83	60	57	92	90	75.855	78.337	7.148	7.307
Possession % (H)	83	83	29	27	76	72	53.048	51.253	11.244	11.261
Possession % (A)	83	83	24	28	71	73	46.951	48.746	11.244	11.261
Tackles won % (H)	83	83	39	37	63	60	50.674	50.650	4.859	4.723
Tackles won % (A)	83	83	37	40	61	63	49.325	49.349	4.859	4.723
Fouls committed (H)	83	83	6	4	23	22	11.819	12.144	3.700	3.693
Fouls committed (A)	83	83	5	3	22	20	12.072	11.891	3.780	4.150
Yellow cards (H)	83	83	0	0	6	6	1.722	2.000	1.193	1.538
Yellow cards (A)	83	83	0	0	6	4	2.228	1.867	1.364	1.102
Red cards (H)	83	83	0	0	1	1	0.036	0.024	0.188	0.154
Red cards (A)	83	83	0	0	1	1	0.084	0.024	0.280	0.154
Cards (H)	83	83	0	0	7	6	1.795	2.096	1.266	1.551
Cards (A)	83	83	0	0	6	5	2.409	1.951	1.344	1.168
Cards difference (H-A)	83	83	-4	-3	5	4	-0,614	0.144	1.681	1.639

N = Sample Size. M = Mean. SD = Standard Deviation. RG = Regular Games. GG = Ghost Games. H = Home Team. A = Away Team.

For our third hypothesis of less pronounced performance indicators for the home team and simultaneously a stronger away team in ghost games, it can be stated that fewer shots are fired by the home team. However, the home team needs 1.563 fewer shots to score a goal in ghost games than before. For the away team both values are almost unchanged. Likewise, no large differences can be found in the duels won. For both teams, the mileage decreases slightly during the game but it decreases more for the home team than for the away team. In any case, the accuracy of passes and the distribution of ball possession have developed in the direction of our hypothesis, since the first one increases more for the away time while the second one decreases for the home team and increases for the away team. All in all, our third hypothesis can be partially confirmed just looking at the descriptive statistics. More meaningful statistic tests are presented in the next subsection.

Tests of Significance

To examine our hypotheses further, we use tests of statistical significance.

First, Chi-square tests are performed for the distribution of home wins, draws and away wins. There are significantly (at the 5% level with an error probability of 4.0%) less home wins while the increases in draws and away wins are not statistically significant. For the other variables, depending on their distributions, different kinds of tests are used as shown in Table 2. All variables were tested, but apart from draw and away win only those are listed in Table 2 that are statistically significant at least weakly with a level of error probability of less than 10%.

Table 2. *Different Statistical Tests (Grouped by Type of Game)*

Variables	**RG**			**GG**					**95 % CI**	
	M	**SD**	**N**	**M**	**SD**	**N**	**Test**	**Sig. (2-tailed)**	**LV**	**UV**
Home win	0.482	0.503	83	0.325	0.471	83	P χ^2	0.040**		
Draw	0.193	0.397	83	0.229	0.423	83	P χ^2	0.568		
Away win	0.325	0.471	83	0.446	0.500	83	P χ^2	0.111		
Home points	1.639	1.367	83	1.205	1.314	83	MWU	0.045**		
Away points	1.169	1.333	83	1.566	1.345	83	MWU	0.045**		
Diffpoints	0.470	2.670	83	-0.361	2.625	83	MWU	0.045**		
Goals (H)	1.855	1.466	83	1.434	1.390	83	KS	0.040**		
Goals difference (H-A)	0.434	2.142	83	-0.229	2.216	83	t-Test	0.052*	-0.005	1.331
Extra time 2nd half (min)	3.735	1.994	83	3.229	1.727	83	t-Test	0.082*	-0.066	1.078
Shots on target (H)	15.976	5.280	83	13.325	5.310	83	t-Test	0.002***	1.028	4.274
Distance run in km (H)	116.580	4.368	83	115.198	4.692	83	t-Test	0.051*	-0.007	2.770
Passes accuracy (A)	75.855	7.149	83	78.337	7.307	83	t-Test	0.028**	-4.697	-0.266
Yellow cards (A)	2.229	1.364	83	1.868	1.102	83	t-Test	0.062*	-0.019	0.742
Red cards (A)	0.084	0.280	83	0.024	0.154	83	P χ^2	0.087*	-0.009	0.129
Cards (A)	2.410	1.344	83	4.050	2.203	83	t-Test	0.020**	0.072	0.844
Cards differnce (H-A)	-0.614	1.681	83	0.145	1.639	83	t-Test	0.004***	-1.268	-0.250

N = Sample Size. M = Mean. SD = Standard Deviation. Sig. (2-tailed) = Significance (2-tailed). RG = Regular Games. GG = Ghost Games. H = Home Team. A = Away Team. MWU = Man-Whitney-U Test. KS = Kolmogorov-Smirnov Test. P χ^2 = Pearson's Chi-Squared Test. CI = Confidence Interval for Exp(B). LV = Lower Value. UV = Upper Value. * $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

The significant decrease in home wins as well as the significant decreases in home goals and the goal difference from the home team's point of view support our hypothesis 1. Also the significant decrease in home points and significant increase in away points show that the home advantage disappears without spectators. Moreover, the variable "Diffpoints", which shows the difference of the scored points from the point of view of the home team, is significantly reduced in favour of our hypothesis.

Regarding hypothesis 2 on the change in referee behaviour, the variable "Extra time 2nd half (min)" is significant (weakly on the 10% level). The difference between the cards of the home and away teams is even more significant (on the 1% level). Moreover, the change in the number of cards for away teams is statistically significant (on the 5% level), while it is weakly so (on the 10% level) for their yellow and red cards.

For hypothesis 3, there are significantly (on the 1% level) less shots fired on target by the home team, while there is a significantly higher pass accuracy of the away team. Furthermore, the home team runs significantly (weakly on the 10% level) less during the ghost games. However, as mentioned above, all other variables listed in Table 1 but not in Table 2 have no significant difference

between regular games and ghost games.

For the differences in goals, cards and market values between home and away teams, additional t-tests are carried out to check whether these differences are significantly different from 0. The home advantage of goals scored is statistically significant (but only weakly at the 10% level) before the COVID-19 break but not after the break. Likewise, the home advantage regarding the distribution of cards is significant (at the 1% level) before but not after the break. The difference in the market values of the two teams is not significant in either case.

Regression Results

To test our hypotheses further, we use regressions that control the influence of several variables at the same time. We regress home wins, the difference in cards and the length of extra time. Concerning hypothesis 3, the performance variables have not provided significant regression results such that they are not discussed further in this section.

For home wins as the dependent variable, a binary logistic regression is suitable. First, we have included all variables listed in Table 1 that are not interdependent. Then we removed all insignificant variables, like the performance variables, and ran a new regression.

Table 3 shows the results with the statistically significant variables. Ghost games are significantly negative for home wins, confirming our hypothesis 1. The variable "Market value difference (H-A)" has a significantly positive influence on home wins (on the 1% level). Furthermore, the length of extra time has a significantly negative influence on home wins. However, this could be a case of reverse causality if the referee gives more overtime in case the home teams is one goal behind or has the chance to win a tied game.

Table 3. *Binary Logistic Regression for Home Wins*[1]

Independent variables	**B**	**Exp(B)**	**Sig.**	**95 % CI**	
				LV	**UV**
Type of game	-0.828	0.437	0.018**	0.220	0.866
Market value difference (H-A)	0.002	1.002	0.001***	1.001	1.003
Extra time 2nd half (min)	-0.210	0.810	0.027**	0.672	0.977

B = Regression Coefficient. Exp(B) = Exponentiation of B, Odds Ratio. Sig. = Significance. CI = Confidence Interval for Exp(B). LV = Lower Value. UV = Upper Value. * $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

There are different regression models that could be used for "Cards difference (H-A)" as independent variable. The variable is sufficiently normally distributed such that a multiple linear regression is possible. To include independent variables in the model, we proceeded as before, starting with all of them without interdependencies and then repeating the regression with the significant ones only. Four of them remain in the model as shown in Table 4. The adjusted R^2 is 0.199. That means 19.9 % of the variance is explained by this model.

[1] -2 Log likelihood = 199.946, Cox & Snell $R^2 = 0.134$, Nagelkerke $R^2 = 0.182$.

Table 4. *Multiple Linear Regression for Cards Difference*

Independent variables	B	Std. Error	T	Sig.	95 % CI	
					LV	UV
Type of game	0.603	0.239	2.526	0.013**	0.132	1.075
Goal difference (H-A)	0.136	0.054	-2.490	0.014**	-0.243	-0.028
Fouls committed (H)	0.126	0.033	3.868	<0.001***	0.062	0.191
Fouls committed (A)	0.136	0.030	-4.473	<0.001***	-0.196	-0.076
Constant	0.406	0.509	-0.797	0.427	-1.412	0.600

B = Regression Coefficient. Std. Error = Standard Error. Sig. = Significance. CI = Confidence Interval for Exp(B). LV = Lower Value. UV = Upper Value. ** $p < 0.05$. *** $p < 0.01$.

The most important result is that the type of game has a significantly positive influence on the difference of cards between home and away teams. Given the fact that home teams get less cards in regular games, this confirms our hypothesis 2 that the home bias in the distribution of cards disappears in ghost games. The difference in goals reduces the difference in cards, meaning that the leading team gets fewer cards. It is not surprising that fouls by the home team have a significantly positive effect on the difference of cards for the home and away team while the fouls of the away team have conversely a significantly negative effect (both on the 1% and even 1‰ level).

For the analysis of "Extra time 2nd half (min)" as dependent variable, the appropriate regression has to be considered again. The deviations from the normal distribution are larger than those for the cards difference but not too large such that a multiple linear regression model can be used again. The variables are chosen as before such that only two independent ones remain in the final regression. The results are shown in Table 5. The adjusted R^2 of this regression is 0.056.

Table 5. *Multiple Linear Regression for Extra Time*

Independent variables	B	Std. Error	T	Sig.	95 % CI	
					LV	UV
Type of game	-0.633	0.286	-2.209	0.029**	-1.198	-0.067
Goal difference (H-A)	-0.191	0.065	-2.929	0.004***	-0.320	-0.062
Constant	3.818	0.202	18.882	<0.001	3.419	4.217

B = Regression Coefficient. Std. Error = Standard Error. Sig. = Significance. CI = Confidence Interval for Exp(B). LV = Lower Value. UV = Upper Value. ** $p < 0.05$. *** $p < 0.01$.

Ghost games significantly reduce the overtime given by the referee. Also statistically significant is the goal difference (on the 1% level). More goals by the home team decrease the overtime. This could be due to a home bias by the referee who gives (only) the home team more time if it needs this time to win or not to lose.

Discussion

We can confirm our first hypothesis that the home bias disappears in ghost games. A purely descriptive examination of the results shows a decline in home wins, home points scored and goals scored by home teams. In statistical tests the decreases of these variables are significant and also in the tests of the individual

samples the goals differences in favour of the home team is significantly positive only before the COVID-19 break (and only weakly on the 10% level). Nevertheless, the disappearance of the home bias does not turn into a significant advantage for the away team or a home disadvantage. Even the increases of away wins and draws are not statistically significant. The binary logistic regression confirms the disappearance of the home advantage even controlling for other variables like differences in team values that are very important by themselves. This confirmation of our first hypothesis follows the results of Reade et al. (2021) as well as Fischer and Haucap (2021), despite some differences in the examination of the home bias.

Regarding our second hypothesis that referees' decisions no longer benefit the home team without spectators, we find significant decreases in the yellow, red and total number of cards for away teams (for the yellow and red ones only weakly on the 10% level). The away teams committed fewer fouls in the ghost games, too, but this difference is not significant. The difference in cards the home and away team got is significantly changed (on the 1% level). In regular games the home teams got significantly (at the 1% level) less cards and in the ghost games they got insignificantly more. This is also confirmed by the linear regression model, in which the ghost games have a significant effect that evaporates any home bias in this regard.

As a further indicator of the change in refereeing behaviour, we use the length of extra time at the end of the game. The linear regression shows a significant influence of the type of match day on the length of extra time but no significant influence of fouls that could cause delays. However, the goal difference from the point of view of the home team has a significantly (on the 1% level) negative influence on the extra time. This is an indicator of a home bias because games are finished sooner when the home team is leading whereas they go on longer if the home team needs one more goal to win or reach a draw. This can explain why there is a significantly negative sign of the length of extra time in the regression model of the home win. In sum, there is strong evidence for a home bias in the refereeing behaviour in regular matches that is at least reduced if not eliminated in ghost games in accordance with our hypothesis.

Our third hypothesis that the performance of the home teams becomes weaker and of the away team becomes stronger without spectators cannot be confirmed. There are only significant differences in the performance characteristics distance run by the home team (weakly on the 10% level), passes accuracy of the away team (on the normal 5% level) and shots on target by the home teams (on the 1% level). Although these differences fit into the direction of the hypothesis as the home teams becomes weaker and the away team stronger, it should be noted that the mileage of away teams also decreases, although insignificantly, while the passes accuracy also increases insignificantly for the home team. The number of shots on target by the home team decreases significantly but the number of shots required per goal decreases insignificantly such that these variables could cancel each other out. It should also be noted that none of the performance variables is significant in the binary logistic regression for the home bias, and therefore the performance characteristics recorded here do not appear to have any relevant

influence on the achievement of a home win.

Conclusions and Outlook

In summary, the disappearance of the home advantage in ghost games can be seen from the pure results as in previous investigations without the emergence of an away advantage. While the performance measures of the teams surveyed here have no relevant influence on this, which is an interesting result in itself, the referees' behaviour changes significantly and contributes to the disappearance of the home bias.

This has some implications for teams and their trainers as well as leagues and their organisers. Teams have to be aware that the situation in ghost games is different. The home bias cannot be taken for granted and the strategies should be adjusted accordingly. However, the normal team performance like running and passing does not seem to make the crucial difference. The influence on the referees is more important, at least according to the results of our study. Perhaps the referees should be more shielded from the spectators in the future when the stadiums will be full again. The greater influence of video referees is going in that direction. The referees on the ground should be made aware of the home bias and their role in it such that they can try to counteract it consciously. In a way, the home bias is unfair, but taking it away within a season is unfair, too, because it is not equalised by an equivalent advantage for the other team in the second part of the season. The same is true when the ghost games will end someday within a season. Letting in only spectators of the home team, as has been discussed by some politicians, would be even worse.

As already mentioned in the introduction, there were external conditions besides the (missing) spectators that influenced the results and are not included in our evaluation, such as the return of key players, different incentives at the end of the season by the table positions, differences in the game schedule before and after the break, different training conditions and preparations of the teams, activities on the transfer market in winter and some rule changes as the possibility to change five players instead of only three during a ghost game. In a perfect experiment, these effects would all be non-existent and games would take place under exactly the same conditions with and without spectators. However, this is not feasible and there has never been such comparability of games with and without spectators as in the season 2019/20.

Just as the German Bundesliga has made a kick-off for football, research on this can be the prelude to a wide range of different research in the sports field on the effects of the COVID-19 pandemic. Further first leagues in Europe should be analysed and also lower leagues could be included, as Fischer and Haucap (2021) have already done for the second and third leagues in Germany. The Economist (2020) also looked at several leagues in Europe and descriptively found a decline but no disappearance of the home advantage while the home bias of referees vanished completely. In addition, possible differences and similarities between men's and women's football could be surveyed. Other variables, other competitions

besides league games as well as other sports could also be analysed.

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Gender Equality and Institutions as the Driving Force of Football Performance: Women vs Men

By Jakub Harman[*]

Gender equality should be a necessity in every developed economy of the world. Despite this assumption, this is not the case. The field of sports is no exception. This study addresses the relationship between gender equality, institutions and football performance of national teams. Correlation and regression analysis is used to determine the relationship between variables. The results suggest that higher gender equality leads to better performance for footballers on the fields. Countries with higher gender equality perform better (more FIFA points). The economic condition of the country has a similar effect on performance. Estimates have shown a statistically significant positive relationship between economic prosperity and performance on the pitch. Climate and age of players do not affect the performance of national teams. Institutional factors significantly affect players' performance. Members of the European Union perform significantly higher than those that are not in the EU. As well as countries in which there was no communist regime in the past[2].

Keywords: *gender inequality index, FIFA ranking, men, women, institutions*

Introduction

Football is clearly a global phenomenon in the field of sports. Every weekend, millions of fans watch football matches in the best football competitions in the world (England, Spain, Germany, Italy and France). Quality football has not escaped the sight of researchers and the experts. Many research articles have focused on quantifying football success (Hofmann et al. 2006) or the economic and financial performance of clubs (Pinnuck and Potter 2006, Cintia et al. 2015). Some focus on motivation of football spectators to watch matches (Correia and Esteves 2007). However, our contribution in this respect is slightly out of line with current trends. The paper focuses on the quantification of the relationship between the football performance of national teams and gender equality in a given country expressed by the Gender Equality Index. It also focuses on institutional factors affecting the performance of representations. At the same time, we focus the research on the performance of both sexes. According to our knowledge, there are few studies that address this relationship, which is why this area of our research is interesting. One of the motivators for solving this problem is the current trend of promoting gender equality in remuneration, opportunities, or other spheres of the national economy. The second motivator is the fact that the women's sports industry has been gaining in importance in recent years. The number of television

[*]PhD Candidate, University of Economics in Bratislava, Slovak Republic.

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broadcasts that cover women's football is increasing significantly. This inextricably leads to an increase in the economic importance of the sector.

Literature Review

A study by Hoffman et al. (2002) is considered a pioneering study of football performance and socio-economic indicators. Their results show that economic, demographic, cultural and climatic factors are important. The authors have revealed inverted U-shaped relationships in the case of the country's climate and economic prosperity. Similarly, population and Latin origin play an important role.

In the relationship between institutional security and football performance, Houston and Wilson (2002) focused on 179 countries and their membership in FIFA measured by the number of years in the organization. The results of their study suggest that membership in FIFA has a positive effect on the performance of individual teams. Performance is also positively correlated with the country's wealth but diminishing economies of scale are emerging.

The study by Hoffmann et al. (2006) is one of the most important in the field. The authors use data from 88 countries for 2002 for women's international football performance and compare it with the performance of their male colleagues. They also include variables of political and gender inequality, namely the income ratio of women and men. Their findings showed that economic and demographic factors have the same effect on the game of men and women, while the effects of political and cultural factors differ. The findings of their study were later criticized.

Macmillan and Smith (2007) identified statistical discrepancies in the pioneering work of Hoffman et al. (2002), including selection bias and number of outliers. The authors therefore added more than 100 observations to the sample and estimated the data as cross-sectional for 2,000. Their results confirmed doubts about the results of Hoffman et al. (2002) whether the country is of Latin origin or not. The authors also identified several new variables affecting football performance.

Leeds and Markova Leeds (2009) argue that football success can be measured in two ways: by measuring a national team's success over time (dynamic approach) or by the number of FIFA points a nation has at a particular point (static approach). The authors concluded that the stronger the country's domestic league, the stronger the national team. Investing in the domestic league is therefore one of the ways to improve the performance of the national team.

Berlinschi et al. (2013) made an estimate for 202 countries for 2010, taking into account FIFA points and FIFA assessments. The authors examine the impact of the migration of professional footballers on their countries of origin. They found that the migration of international football players is improving performance, especially in countries with lower quality domestic leagues.

Jacobs (2014) studies the determinants of women's international football performance. This study uses data from 2006 for 139 FIFA member countries. In the models, the authors check variables for economic factors, gender equality, talent, climate, as well as political and cultural factors. The author shows that

dedicated management and training are key predictors of successful football countries.

Methodology

The paper deals with the relationship between the performance of football teams and gender equality measured by the Gender Inequality Index as well as other socio-economic or institutional factors. The data collected cover 51 countries (Europe, the Caucasus and Kazakhstan) for 2019. The data sources are from publicly available statistical databases of FIFA[3], the World Bank[4], TransferMarkt[5] and the United Nations Development Program[6]. Table 1 provides a descriptive statistics of observed variables. Women have reached more points than men on average. The standard deviation is also higher for women, which means that the variation in team quality is higher for women than for men. About half of the countries are members of the European Union and a similar number had a communist regime in the past.

Table 1. *Descriptive Statistics*

	Mean	**Sd. Dev.**	**Min**	**Max**	**Exp. Effect**
Women	1524.975	315.23	749	2088.72	
Men	1413.532	211.347	940.3	1832.33	
GDPpc	30016.645	24429.451	3115.861	107457.99	+
Temperature	8.908	4.406	-5.1	19.2	+/-
EU	0.529	0.504	0	1	+
Post_Communist	0.471	0.504	0	1	-
Age (Male)	26.806	0.81	25.2	28.4	+
Age (Female)	24.291	1.599	20.643	27.667	+
GII	0.143	0.083	0.025	0.331	-

From a methodological point of view, the paper uses correlation and regression analysis. We estimate the linear function for football performances represented by the number of points in the FIFA ranking. In the case of the relationship, we estimate the equation in the form:

$$Y_i = \beta_0 + \beta_1 GII_i + \beta_2 \log\_GDPpc_i + \beta_3 Temperature_i + \beta_4 Age_i + \beta_4 Age_i^2 + \varepsilon_i \quad (1)$$

[3]Available at: < https://www.fifa.com/fifa-world-ranking>.
[4]Available at: < https://data.worldbank.org/>.
[5]Available at: < www.transfermarkt.com>.
[6]Available at: < http://hdr.undp.org/en/content/gender-inequality-index-gii>.

Where:

- Y_i is the FIFA ranking of the men's and women's national teams in country i.
- GII_i is the Gender Inequality Index in country i.
- $GDPpc_i$ is the gross domestic product per capita in country i.
- $Temperature_i$ is a variable that takes into account the climate and the outside temperature in country i.
- Age_i is the average age of the national teams in country i.
- $\mathcal{E}_i$ is an error term.

One of the goals of the paper is to quantify the institutional implications for the football performance of national teams. We estimate this relationship by the following equation:

$$Y_i = \beta_0 + \beta_1 EU_i + \beta_2 Post\_Communist_i + \beta_3 EU * Post\_Communist_i + \varepsilon_i \quad (2)$$

Where:

- Y_i is the FIFA ranking of the men's and women's national teams in country i.
- EU_i is a dummy variable expressing whether a country is in the European Union or not.
- $Post\_Communist_i$ is a dummy variable expressing whether there was a communist regime in the country in the past or not.
- $EU*Post\_Communist_i$ is an interaction variable that takes into account whether the country was communist and is currently part of the European Union.
- $\mathcal{E}_i$ is an error term.

The Gender Inequality Index measures gender inequalities in three important aspects of human development - reproductive health, as measured by maternal mortality rates and adolescent birth rates; empowerment measured by the proportion of parliamentary seats occupied by women and the proportion of adult women and men aged 25 and over with at least some secondary education; and economic status, expressed as labor market participation and measured by the labor force participation rate of the female and male population aged 15 and over (UNDP). The higher the GII value, the greater the inequalities between women and men and the greater the loss to human development. The GII value ranges between 0 and 1, with 0 being 0% inequality, which means that women are treated the same as men, and 1 is 100% inequality, which means that women are doing poorly compared to men. In the case of the impact of the index on football performance, we assume that gender equality will have a positive effect on the quality of their performance. This gives hypothesis 1.

H1: Gender equality has a positive effect on the football performance of national teams.

The economic situation of countries is captured using the variable GDPpc, which expresses the gross domestic product per capita in the country. We assume that higher income in the country will mean better infrastructure, better stadiums, better training facilities for players and higher quality coaches. For this reason, we assume that the relationship between performance and income will be positive.

H2: Income per capita has a positive effect on the football performance of national teams.

The right "operating" temperature during a football match can have a significant effect on the performance on the field. The literature indicates that the true temperature is approximately 14 degrees Celsius (Hoffmann et al. 2006). Therefore, we use variable Temperature, which takes into account the average air temperature in the country. The variable is centered at 14 degrees Celsius, which means that its values represent a deviation from this value.

H3: The air temperature in the country affects the performance on the field.

We believe that the age of the players will have a significant impact on the performance of the team. With older age, very important football experience and wisdom are brought to the team. Combined with youthful predation, the experience of older players is an important aspect of national team performance. However, the assumption is that the performance of players decreases from a certain age, because they are no longer able to keep up with their younger colleagues. For this reason, the age squared is also incorporated into the function.

H4: Age has a positive effect on team performance.

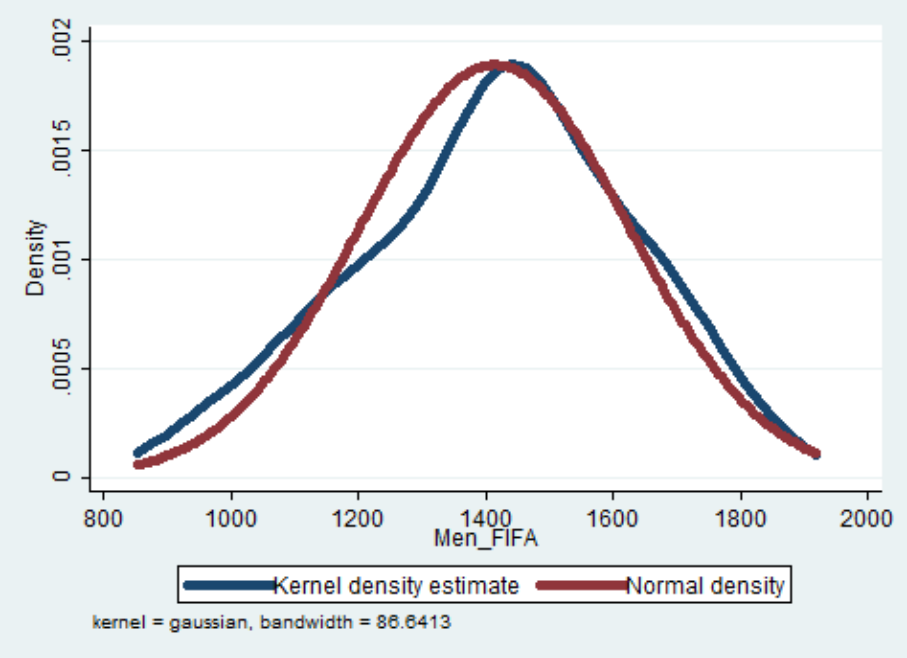
Institutional factors play an important role and are among the most important factors influencing the sporting situation in the country. Institutional factors include, for example, sports infrastructure, the quality of stadiums, lawns, training facilities or the bureaucratic burden on players during transfers and many others. We assume, for example, that the bureaucratic burden on players is significantly lower in the event of a transfer within the European Union, which means that players from "weaker football leagues" can also get into the top leagues more easily than players from third countries. Similarly, we assume that countries that used to have a communist regime have infrastructure built at a lower level, and therefore the quality of their results will be lower.

H5: EU countries perform better than non-EU countries.
H6: Post-communist countries perform weaker than Western countries.

Results

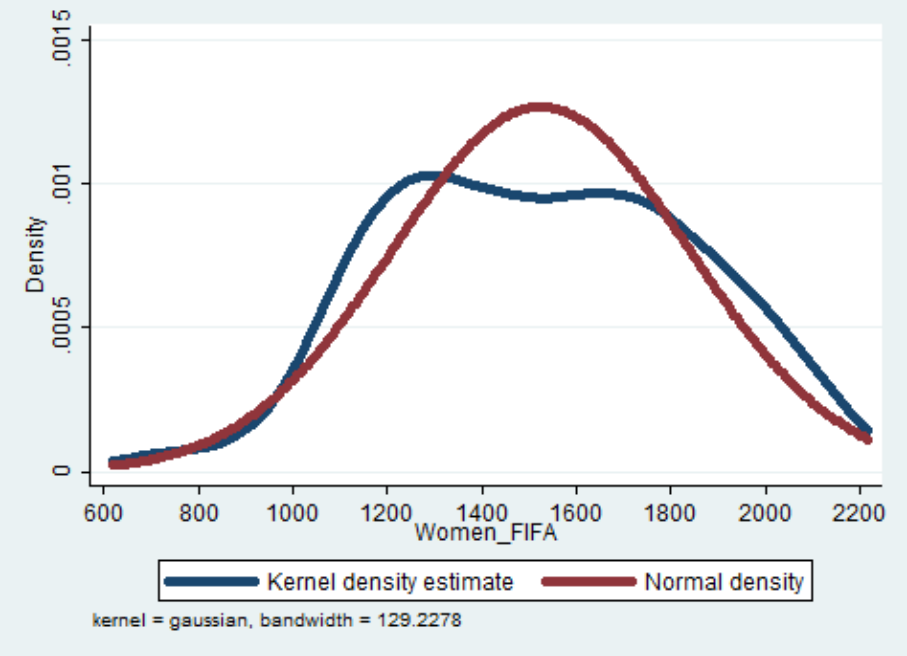
The aim of the paper is to identify the relationship between the football performance of national teams and gender equality and institutional factors in the country.

Figure 1. *FIFA Points Density (Men)*



Source: FIFA, own calculations.

Figure 2. *FIFA Points Density (Women)*

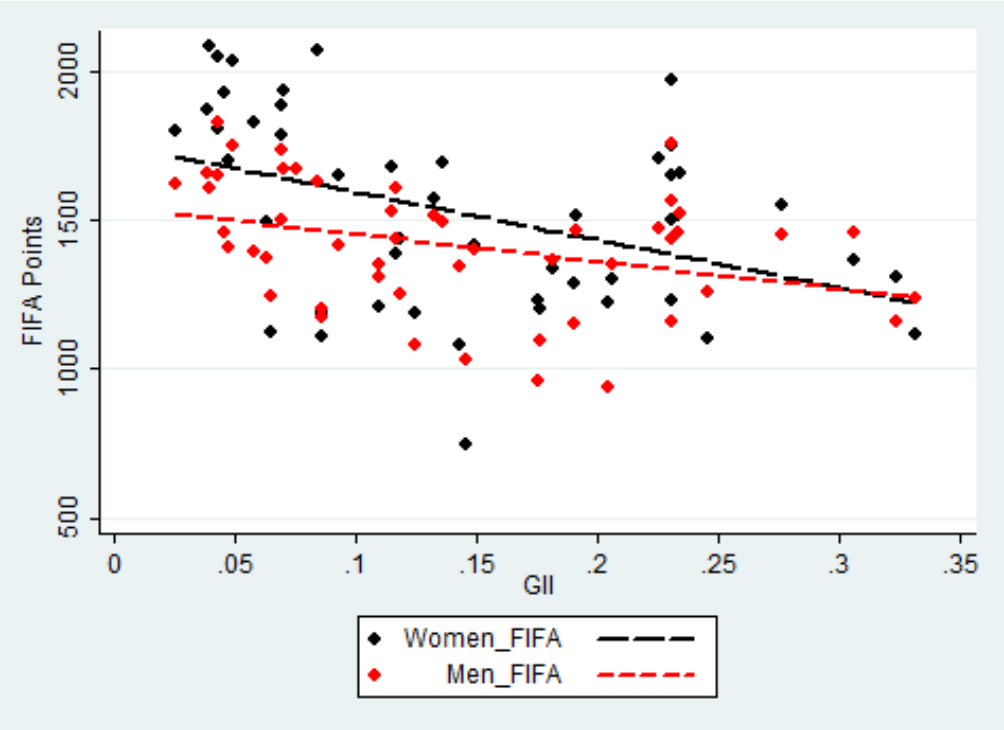


Source: FIFA, own calculations.

Figures 1 and 2 provide an insight into the density distribution of FIFA points by gender. The distribution of men's points is very similar to the normal distribution. This indicates a high level of competition between the teams and only a few outliers who have a small/large deviation compared to the average. In the case of women, we see a slight bevel to the left. This means that there are several teams with a low number of points in the selection. These teams are therefore weaker than the rest of the selection. It also suggests greater variation in data and inequalities in the quality of women's football teams as opposed to men, where greater equality prevails.

Figure 3 shows the relationship between the FIFA points achieved by national teams by gender and the Gender Inequality Index. We assume that the relationship between these variables is negative. We know that higher index values mean higher gender inequality and, according to the graph, lead to lower FIFA points. Inequalities therefore negatively affect the quality of football players' performance for both sexes. This relationship is stronger for women than for men.

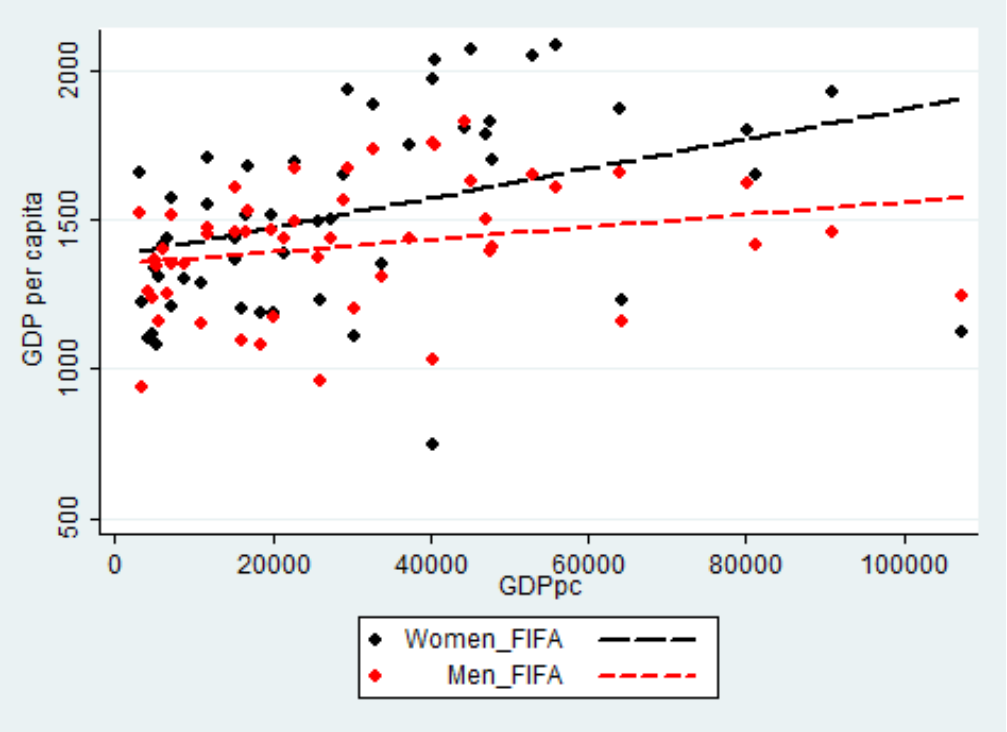
Figure 3. *Scatter FIFA-GII*



Source: FIFA, World Bank, own calculations.

Figure 4 provides an insight into the relationship between football performance and the country's economic prosperity in terms of gross domestic product per capita. We can see from the graph that the variables are positively correlated. Higher per capita income leads to better results. We assume that countries with a higher gross domestic product will have a better sports infrastructure (stadiums, training grounds, availability of sports grounds, etc.). Consequently, the results on the field are better than in the case of countries with worse economic conditions. The relationship is stronger for women.

Figure 4. *Scatter FIFA-GDP per Capita*



Source: FIFA, World Bank, own calculations.

Table 2 shows the individual correlation coefficients between the observed variables. The p-value is given in parentheses. The main interest is lines 3 and 4, which show the coefficients between gender inequality and per capita income. There is a negative statistically significant relationship between the gender inequality index and football performance, which supports our hypothesis. In the case of the economic situation in the country and football performance, there is a positive statistically significant correlation. Membership in the European Union also positively correlates with the results of national teams. In countries where the communist regime was in the past, the correlation is negative and statistically significant.

Table 2. *Correlation Matrix*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Women	1.000									
(2) Men	0.826***	1.000								
	(0.000)									
(3) GDPpc	0.463***	0.334**	1.000							
	(0.001)	(0.017)								
(4) GII	-0.420***	-0.358***	-0.594***	1.000						
	(0.002)	(0.010)	(0.000)							
(5) Temperature	-0.212	-0.022	-0.091	0.043	1.000					
	(0.135)	(0.878)	(0.527)	(0.762)						
(6) Age (Male)	-0.088	-0.015	-0.046	-0.099	-0.167	1.000				
	(0.541)	(0.919)	(0.749)	(0.487)	(0.243)					
(7) Age (Female)	0.623***	0.503***	0.421***	-0.179	-0.217	-0.027	1.000			
	(0.000)	(0.000)	(0.002)	(0.209)	(0.126)	(0.850)				
(8) EU	0.252*	0.244*	0.388***	-0.473***	0.144	-0.032	0.190	1.000		
	(0.075)	(0.084)	(0.005)	(0.000)	(0.312)	(0.822)	(0.182)			
(9) Post_Comm	-0.425***	-0.348**	-0.806***	0.417***	-0.197	0.062	-0.473*	-0.134	1.000	
	(0.002)	(0.012)	(0.000)	(0.002)	(0.167)	(0.667)	(0.000)	(0.348)		
(10) EU*Comm	-0.155	-0.107	-0.122	0.085	-0.109	-0.040	-0.203	0.494***	0.556***	1.000
	(0.278)	(0.455)	(0.395)	(0.552)	(0.446)	(0.783)	(0.154)	(0.000)	(0.000)	

*** p<0.01, ** p<0.05, * p<0.1.

In Table 3 we find the core of the analysis, which is an estimate of the linear function. The table shows 4 models, 2 for women and 2 for men. Model (1) estimates the relationship between the results of women's representation and the Gender Inequality Index, which is negative and statistically significant. However, since the index can only reach values between 0 and 1, the interpretation of the estimated coefficients only makes sense if they are divided by 10. According to model (1), we argue that increasing the GII by 0.1 unit would reduce women's performance by 180.11 FIFA points. This suggests that gender equality has a positive impact on the performance of women's teams, as higher GII values represent higher inequality. A similar result was confirmed in model (2). It is extended by other variables, of which only the indicator of economic prosperity - GDPpc - is statistically significant. An economic increase of 1% has a positive effect on football performance by an average of 118.55 points. The climate and age of footballers are insignificant and therefore do not play a role. Models (3) and (4) estimate the equation for the performance of men's national teams. The results reveal that the effect of increasing gender equality is significantly lower for men, even insignificant in model (4). Age and weather play no role in men's performance either. However, the country's economic prosperity is a major driver of national team performance. Richer countries perform better than poorer ones. GDPpc coefficients are statistically significant for both sexes.

Table 3. *Regression Analysis*

	(1)	**(2)**	**(3)**	**(4)**
	Women	Women	Men	Men
GII	-1,801.102***	-1,141.981***	-899.984***	-301.741
	(312.675)	(311.281)	(213.159)	(338.956)
GDPpc (log)		118.550***		97.576***
		(39.777)		(33.377)
Temperature		-1.990		2.415
		(3.960)		(3.807)
Age (Female)		603.694		
		(613.429)		
Age^2 (Female)		-10.307		
		(12.335)		
Age (Male)				821.370
				(1,974.038)
Age^2 (Male)				-15.433
				(36.878)
Constant	2,021.563***	-7,927.044	1,694.188***	-10,277.096
	(57.284)	(7,448.060)	(38.861)	(26,504.477)
Observations	51	51	51	51
R-squared	0.404	0.706	0.267	0.406

Standard errors in parentheses; Weighted by country population.
*** p<0.01, ** p<0.05, * p<0.1.

One of the subjects of interest is the influence of institutions on the football performance of national teams. Table 4 shows the results of the estimates of equation (2) by gender. The results show that countries that are members of the European Union achieve significantly higher FIFA scores than countries that are not. We attribute this phenomenon to the fact that the free labor market in the European Union allows players from EU countries to move freely between league competitions. For this reason, it is legislatively and bureaucratically easier for players to change their place of action and move to better competition, which further supports the growth of player performance. This effect is higher in women's football than in men's.

In the case of countries that have experienced a communist regime in the past, the presumption prevails that they will achieve lower results than countries in which there was no such regime. The results confirm this hypothesis. We assume that the post-communist countries have lower capital adequacy and thus the infrastructure, whether club or economic, is weaker compared to the countries of the West. This effect is more pronounced in men's football.

Table 4. *Regression Analysis controlling for Institutions*

	(1)	(2)	(3)	(4)	(5)	(6)
	Women	Women	Women	Men	Men	Men
EU	244.762***	181.047***	325.126***	143.542***	86.610**	112.984**
	(64.520)	(66.011)	(78.614)	(40.578)	(37.472)	(47.625)
Post_Communist		-171.654**	-12.238		-162.216***	-131.952**
		(67.019)	(82.693)		(38.295)	(51.016)
EU_Communist			-368.331***			-69.686
			(125.695)			(77.414)
Constant	1,610.520***	1,713.804***	1,617.883***	1,477.922***	1,571.523***	1,554.061***
	(45.969)	(59.363)	(64.144)	(29.180)	(33.481)	(38.752)
Observations	51	51	51	51	51	51
R-squared	0.227	0.320	0.425	0.203	0.420	0.430

Standard errors in parentheses; Weighted by country population.
*** p<0.01, ** p<0.05, * p<0.1.

Women's representations in countries that are members of the European Union and have had a communist regime in the past achieve, on average, significantly worse results than their counterparts. In the case of men, this effect has not been confirmed.

Conclusions

Gender equality has long been considered an important pillar of the development of the nation and democracy. Therefore, it can be concluded that high gender inequality has a negative impact on economic growth as well as the socio-economic attributes of society. In this paper, we deal with the impact of gender inequality on the performance of men's and women's football teams in an international forum. The results show that higher gender inequality significantly undermines both performances on the pitch for both sexes, which means that countries with higher gender equality perform better in football (H1 - accepted). The economic prosperity of the state, as expected, have a positive statistically significant effect on the results of national teams for both men and women. Countries with higher income levels and better economic as well as sports infrastructure perform better on football pitches (H2 - accepted). Climate and age of athletes, according to our estimates, do not have a significant impact on their performance (H3 and H4 - rejected).

On the contrary, institutional factors related to membership in the European Union have a significantly positive and statistically significant effect on the evaluation of FIFA points (H5 - accepted). This effect is higher in women's game than in men's. Countries in which there was a communist regime in the past achieve an average of 132-172 points less in the FIFA ranking compared to countries that have not experienced this regime, the countries of the West (H6 - accepted). This effect is only significant for men. It is interesting to note that women's football teams in countries in the European Union and in which the communist regime was in the past achieve an average of almost 370 points less than their counterparts. In the case of men, this effect is insignificant.

Policies to improve the situation in the field of gender equality have positive results not only on the economy as such, but also on other areas such as cultural or sports life. Therefore, the society should focus on this area. It is important to keep in mind that women's football can also be an attractive sport.

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Motivation Differences between Youth Single-Sport, Multi-Sport, and Single-Sport Specialized Athletes in the Western United States

By Kyle L. Crouch[*]*, Abigail Larson*[±] *& Mark DeBeliso*[•]

The motivation for youth sport involvement may differ for single-sport (non-specialists), multi-sport, and single-sport specialized athletes. To investigate differences between adolescent single-sport athletes (NSSA), multi-sport athletes (MSA), and single-sport specialized athletes (SSSA) on measures of sport enjoyment and motivation. A secondary aim was to compare these variables between age groups. Adolescent sport participants in 6th, 7th, and 8th grade from the Western United States (n=306, age=13.0±1.0 yrs) completing the Sources of Enjoyment in Youth Sport Questionnaire (SEYSQ) that assesses sport enjoyment in the subscales of self-referenced competency (SRC), other-referenced competency and recognition (ORCR), effort expenditure (EE), competitive excitement (CE), affiliation with peers (AP), and positive parental involvement (PPI). The participants also reported their age, gender, grade, years of sport participation and sport status (NSSA, MSA, SSSA). SSSA reported significantly more enjoyment in all subscales except PPI when compared to NSSA ($p<0.05$; ES 0.4 – 0.99). MSA and SSSA showed significant differences in the subscales of SRC and EE; however, effect size was small (0.37 and 0.33, respectively). Overall scores for intrinsic and extrinsic motivation were significantly lower among NSSA compared to MSA and SSSA ($p<0.01$) with no differences between MSA and SSSA ($p>0.05$). Results revealed no significant differences in the SEYSQ's subscales for age ($p>0.05$). Within the parameters of this study, adolescents that specialize in a single sport or those who compete in multiple sport both rely on intrinsic and extrinsic sources of enjoyment for motivation in very similar ways; whereas adolescent NSSA are less motivated and experience less enjoyment from sport participation compared to MSA and SSSA.

Keywords: *adolescent, enjoyment, SEYSQ, motivation, sport psychology*

Introduction

The study of motivation is amongst the most predominant topics within sport psychology (Roberts 2001). Within athletics, most would agree that motivation is the foundation or the "heart" of sport performance and achievement (Duda and Treasure 2015). Because of the importance of motivation for optimal sport performance, continued study of the topic, particularly during developmental periods, is warranted. Clancy et al. (2017, p. 1) emphasize this need and state,

[*]Graduate Student, Department of Kinesiology and Outdoor Recreation, Southern Utah University, USA.
[±]Associate Professor, Department of Kinesiology and Outdoor Recreation, Southern Utah University, USA.
[•]Professor, Department of Kinesiology and Outdoor Recreation, Southern Utah University, USA.

"There is utility in studying motivation, as it provides a theoretical and practical insight into why one initiates, regulates, sustains, directs, and discontinues behavior". Ideally, those involved in youth sport development programs understand and utilize motivational techniques that enhance sport performance, enjoyment, and engagement. In turn, this creates situations that encourage an athlete to continue to participate in sport, reach feelings of competency, and perform to their highest abilities.

Current research suggests motivation levels, as well as specific motivators, vary among athletes. According to the Self-Determination Theory (Deci and Ryan 1985), the orientation of motivation is distinguished between intrinsic and extrinsic motivation (Ryan and Deci 2000). Intrinsic motivation refers to engaging in an activity because it is interesting, fulfilling, and enjoyable, while extrinsic motivation refers to external reasons for sport participation, such as receiving a reward or avoiding punishment (Rottensteiner et al. 2015). Previous research indicates intrinsic and extrinsic motivation are essential concepts for understanding sources of enjoyment and continued participation in athletics (Deci and Ryan 2002, Vallerand and and Rousseau 2001).

Throughout an athlete's sport experience, there is a need to balance intrinsic and extrinsic motivation (Sugarman 1999). Using extrinsic rewards to motivate a young athlete can bring short-term enjoyment and improve athletic performance but relying heavily on such dividends may be detrimental to intrinsic motivation. According to Hatch et al. (n.d.), "Extrinsically motivated athletes tend to focus on the competitive or performance outcome. An over-emphasis on extrinsic motivation may lead athletes to feel like their behavior is controlled by the extrinsic rewards." Thus, an excess of extrinsic rewards will draw athletes away from the enjoyment of sport activity. In addition, focusing on the performance outcomes can cause anxiety and loss of interest and value of achievement for an athlete (Hatch et al. n.d.). Furthermore, providing tangible rewards for engaging in an activity, completing an activity, or reaching a certain level of performance in an activity, may undermine intrinsic motivation, especially in school-aged children (Deci et al. 2001). However, the use of extrinsic methods of motivation that promote self-determined motivation, such as positive verbal feedback by a coach, positively impacts intrinsic motivation and feelings of competence (Vallerand and Reid 1988).

Enjoyment is considered a critical component of the competitive youth sport experience (Scanlan and Lewthwaite 1986), and an important aspect of intrinsic and extrinsic motivation. Research suggests sport enjoyment is correlated with motivation (Scanlan et al. 1989), engagement (Weiss and Chaumeton 1992), and continued involvement (Scanlan et al. 1993). The definition of sport enjoyment is widely accepted as "a positive affective response to the sport experience that reflects generalized feelings such as pleasure, liking, and fun" (Scanlan et al. 1993). This definition has its roots in an earlier study conducted by Scanlan and Lewthwaite (1986), which introduced the model of sport enjoyment. This model conceptualizes how enjoyment in sport experiences can come from several sources by combining achievement and nonachievement components with intrinsic and extrinsic elements (Wiersma 2001). Accordingly, enjoyment is not synonymous

with intrinsic motivation. Although enjoyment is associated with intrinsic motivation, sources of enjoyment may also come from extrinsic aspects of training and competition (Scanlan and Lewthwaite 1986).

Determining the amount and sources of sport enjoyment experienced by an athlete also provides valuable information as to what motivates an individual to participate in sport. The Sources of Enjoyment in Youth Sport Questionnaire (SEYSQ) (Wiersma 2001) is a 28-item survey that quantifies sport enjoyment by, among other things, measuring the level of intrinsic and extrinsic motivation (Figure 1). Using the SEYSQ for data acquisition 526 adolescents, Ages 14-18, participated in a study conducted by Berki and Piko (2017). Their study's research indicates that "there are important differences according to age and gender in the sources of sport enjoyment" (Berki and Piko 2017, p. 230). Their results suggest a negative association between age and sources of sport enjoyment, meaning that sport enjoyment decreases with age. Between genders, boys scored higher in CE and ORCR subcategories, indicating that boys are more competitive than girls, whereas girls PPI as a higher source of enjoyment than boys. Other factors shown to affect sport enjoyment include coaching influences and the nature of the sport. A 2008 study by McCarthy, Jones, and Clark-Carter, assessed sources of enjoyment among 152 youth sport athletes, Ages 8-15, participating in different sport types (team sport and individual sport) using the SEYSQ. Participants who competed in basketball, football [soocer], netball, rounders, hockey, and rugby were classified as team-sport athletes, and those who competed in athletics, badminton, cricket, cycling, martial arts, swimming, tennis, and trampolining as individual-sport athletes. It is reported that participants in team sport had significantly greater self-referenced competency, affiliation with peers, competitive excitement, positive parental involvement, and enjoyment compared with individual sport participants and suggests:

> Team sport for children in the sampling and specializing years of sport participation offer a unique blend of enjoyment sources that would benefit all children. Moreover, a team sport in addition to an individual sport may serve the needs of children in the sampling years before they enter the specializing years when they choose a sport to specialize in (McCarthy et al. 2008).

Research on the effects of other factors, such as specific type of sport played or number of sport in which an athlete participates, on sport enjoyment is limited. Those involved in youth sport development programs would benefit from additional research in this area of study. To this end, coaches and trainers need to understand the different motivators among specific populations of athletes. Additionally, coaches and trainers would benefit by understanding common sources of enjoyment and motivation among diverse athlete groups; however, little is known regarding the level of sport enjoyment and primary motivators to participate in sport in specific populations. For example, sport samplers may have different sources and degrees of enjoyment compared to sport specialists.

Specifically, in reference to sport specialists, previous research suggests early sport specialization may reduce intrinsic motivation (Wiersma 2000, Gould and Carson 2004, Côté et al. 2009). Athletic development occurs over the course of

three stages: early years, middle years, late years (Bloom 1985). Each stage respectively plays a vital role in the development of an athlete. Desired athletic development starts with a focus on fun and passion for athletics through participation in multiple sport (early years), moves to skill progression for specific sport (middle years), and reaches technical skill expansion through extensive, deliberate practice for optimal performance in a single sport (late years) (Gould and Carson 2004). Gould and Carson (2004) maintain that the majority of champion-level athletes do not skip any of developmental stages in order to specialize early in a sport, and they assert that when stages are skipped in order to specialize early, it "usually has dire consequences, as elite performance is based on the development of proper fundamentals." Moreover, if the early-years stage that emphasizes fun and love of the activity is passed over for specialized practice and advanced training, the athlete may not develop an intrinsic desire and motivation for the sport. Other studies also show that the bulk of elite athletes surveyed participated in various sport (sampling) prior to single-sport specialization (Côté et al. 2009).

When using the SEYSQ, are there significant differences between single-sport athletes (NSSA), multi-sport athletes (MSA), and single-sport specialist athletes (SSSA), respectively, on measures of sport enjoyment and/or measures of intrinsic and extrinsic motivation? To the best of our knowledge, this study is the first to consider the relationship between sport status (NSSA, SSSA, or MSA) and sources of enjoyment in youth adolescent athletes. The findings from this study will help those involved in youth sport tailor motivational practices for specific athlete populations. Thus, influenced by the current trend of early sport specialization and outcomes of sport enjoyment and motivation, this study aims to quantify the amount and sources of sport enjoyment among adolescent athletes and assess differences between NSSA, MSA, and SSSA. A secondary purpose of this study is to describe any differences in sources of enjoyment and motivation between age groups (grades).

Methods and Materials

Participants

The Southern Utah University IRB committee (IRB APPROVAL #24-032021a) and a Utah school district approved this study prior to participant recruitment. Participants for this study represent a convenience sample which consisted of 306 athletes (190 male and 116 female athletes) separated by grades, 6^{th} (11-12 years), 7^{th} (12-13 years), and 8^{th} (13-14 years) within a Utah school district and compete in one or more organized sport. Participation was voluntary. The Southern Utah University IRB committee and county school district waived the requirement for parental permission and minor assent. The county school district and IRB committee permitted passive consent with the precondition that students and parents be provided a parental consent document that included potential benefits, adverse consequences, anonymity protection and data security,

the ability for the student to withdraw at any time, researcher's contact information, and a way for the parent to see survey items. Information was disseminated to parents via handouts and email.

Procedures

A short presentation about the survey was given to students during physical education classes when the survey was distributed. Student-athletes who volunteered to participate were given a pencil and paper document that included the researcher-designed demographic questionnaire and the Sources of Enjoyment in Youth Sport Questionnaire (SEYSQ). The researcher briefly introduced the survey format and terms and answered any questions. Student participants were asked to complete the entire survey as honestly as possible. Upon completing all survey questions, students returned the paper document to the researcher. Participation in this study was voluntary, and data collected from the questionnaire was anonymous, untraceable, and analyzed in aggregate. No compensation was provided for participation.

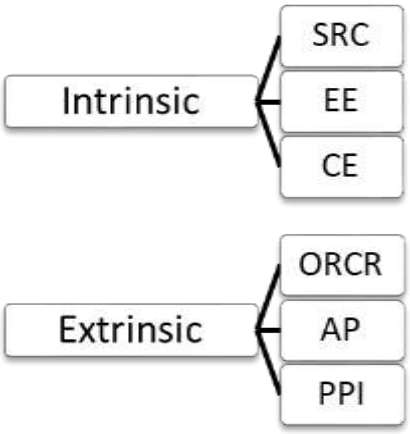
Instruments

The demographics questionnaire included two sections. Section 1 contained four multiple-choice questions to assess age, gender, grade in school, and total years involved in organized sport. Section 2 contained questions regarding the athlete's status, sport played, and the amount of time spent in each respected sport over the past 12-month period. The athlete self-identified as either an NSSA (athlete that competes in a single organized sport), MSA (athlete that competes in more than one organized sport), or SSSA (athlete that specializes in a single organized sport dedicating eight or more months per year to the specific sport through games, practices, training, etc.) (Jayanthi et al. 2013). Each participant also identified his/her respective sport(s) and the number of months dedicated to each sport in the last calendar year. Time dedicated to each sport for multi-sport athletes had the potential of adding up to more than 12 months, as some sport seasons and training periods overlap.

The third and final portion of the survey was the SEYSQ, a 28-item questionnaire designed to quantitatively measure the sources of enjoyment in youth sport using a 5-point Likert Scale (1=not at all, 2=a little, 3=not sure, 4=yes, 5=very much) Wiersma (2001). The SEYSQ provides data that enables researchers to classify participants within extrinsic/intrinsic and achievement/ nonachievement continuums (Wiersma 2001). The 28-items scaled on the SEYSQ are distributed into a 6-factor model of sport enjoyment, including self-referenced competency (SRC), other-referenced competency and recognition (ORCR), effort expenditure (EE), competitive excitement (CE), affiliation with peers (AP), and positive parental involvement (PPI). Second-order factor structures realized through these six factors are extrinsic/intrinsic and achievement/nonachievement models. Factors that contribute to intrinsic motivation include SRC, CE, and EE subscales. Factors contributing to extrinsic motivation include ORCR, AP, and PPI subscales (see

Figure 1). Achievement and nonachievement models were not explored in the present study.

Figure 1. *Contributing Subcategories for Intrinsic and Extrinsic Motivation*



SRC: Self-Referenced Competency, CE: Competitive Excitement, EE: Effort Expenditure,
ORCR: Other Referenced Competency and Recognition, AP: Affiliation with Peers, PPI: Positive Parental Involvement

Design and Analysis

Survey data were checked for completeness, input into Microsoft Excel, and analyzed. Descriptive statistics for age, gender, grade, sport status, and the amount of time spent competing in sport over the previous 12-month period were calculated. Data were categorized by sport status: NSSA, MSA, and SSSA. Means and standard deviations were calculated for each of the 6 factors on the SEYSQ (SRC, CE, EE, ORCR, AP, and PPI) and compared between NSSA, MSA, and SSSA. Scores from corresponding subcategories were summed to yield an intrinsic and extrinsic motivation score, respectively, and means were compared between NSSA, MSA, and SSSA. Corresponding subcategories are classified according to Wiersma (2001), see Figure 1. Means and standard deviations for each of the previously listed variables were calculated and compared between all males and females, respectively, as well as between the 3 different grades, respectively. Comparisons between the 3 sport status groups were made using a single-factor ANOVA test. Post hoc analysis was conducted using the Scheffe Method. Independent two-sample t-tests were used for age and gender comparisons. Significance was set at $p \leq 0.05$ for all. Effect size was calculated for all variables that showed significant differences and classified, as defined by Cohen (1988), as: small d=|0.2|, medium d=|0.5|, and large d=|0.8|.

Results

Participants in this study represented 34 sports, including baseball, basketball, football, soccer, dance, volleyball, cheerleading, etc. Demographic information regarding participant gender and grade is presented in Table 1. Participant gender, grade, and competitive sport status are shown in Table 2.

Table 1. *Participant Gender and Grade*

	GRADE			
	6*	**7****	**8*****	**Total**
Male	57	27	106	190
Female	37	13	66	116
Total	94	40	172	306

*mean age 11.8 years; standard deviation ± 0.5
** mean age 12.7 years; standard deviation ± 0.5
***mean age 13.6 years; standard deviation ± 0.5

Table 2. *Participant Sport Status by Gender and Grade*

Male (n=190)				
Sport Status	**Grade**			
	6*	**7****	**8*****	**Totals**
NSSA	6	3	16	25
MSA	40	18	55	113
SSSA	11	6	35	52
Total	57	27	106	190
Female (n = 116)				
	6*	**7****	**8*****	**Totals**
NSSA	6	2	9	17
MSA	16	7	22	45
SSSA	15	4	35	54
Total	37	13	66	116

NSSA: Single-sport Athlete **MSA**: Multi-sport Athlete **SSSA**: Single-sport Specialized Athlete
*mean age: male=11.8 years; standard deviation ± 0.5 years/female=11.7 years; standard deviation ± 0.5 years
**mean age: male=12.7 years; standard deviation ± 0.5 years/female=12.8 years; standard deviation ± 0.6 years
*** mean age: male=13.6 years; standard deviation ± 0.5 years/female=13.7 years; standard deviation ± 0.5 years

Descriptive statistics (means and standard deviations) for each subcategory of the SEYSQ are presented in Table 3. Higher scores indicate a greater source of enjoyment. The highest possible scores vary between categories and are as follows: SRC, CE, and PPI 20 points each, EE and AP 25 points each, and ORCR 30 points (Table 3). Subcategories were grouped into intrinsic and extrinsic categories, respectively, and summed for a total intrinsic and extrinsic score (Table 3).

Significant differences ($p<0.05$) between sport groups were found for all of the SEYSQ subcategories except for PPI (Table 3). Post-hoc testing using the Scheffe Method was used to determine where these differences were between each of the respected sport status groups (Table 4). NSSA scored significantly lower on several measures of enjoyment and overall intrinsic and extrinsic enjoyment, respectively, compared to MSA and SSSA (Tables 3 and 4). MSA and SSSA differed significantly on measures SRC and EE, both associated with intrinsic motivation,

but total intrinsic and extrinsic motivation scores, respectively, did not differ between MSA and SSSA (Table 3 and 4).

Table 3. *NSSA, MSA, and SSSA Comparison within the SEYSQ Subcategories*

Intrinsic Categories				
	SRC	CE	EE	Overall Scores
	(highest score possible= 20)	(highest score possible= 20)	(highest score possible= 25)	(highest score possible= 65)
NSSA (n=42)	16.9 +/- 2.2	16.1 +/- 2.7*	19.1 +/- 3.6*	52.0 +/- 7.0*
MSA (n=158)	17.5 +/- 2.2**	17.9 +/- 2.1	21.3 +/- 3.0**	56.7 +/- 6.1
SSSA(n= 106)	18.3 +/- 1.8***	17.9 +/- 2.5***	22.2 +/- 2.7***	58.4 +/- 5.5***
	P-value = 0.00	*P-value* = 0.00	*P-value* = 0.00	*P-value* = 0.00
Extrinsic Categories				
	ORCR	AP	PPI	Overall Scores
	(highest score possible= 30)	(highest score possible= 25)	(highest score possible= 20)	(highest score possible= 75)
NSSA (n=42)	19.6 +/- 5.4*	19.9 +/- 4.4	16.4 +/- 3.7	55.9 +/- 10.6*
MSA (n=158)	23.4 +/- 4.8	21.1 +/- 3.0	16.6 +/- 3.5	61.1 +/- 8.5
SSSA(n= 106)	23.1 +/- 5.4***	21.4 +/- 3.3***	17.1 +/- 3.2	61.6 +/-9.5***
	P-value = 0.00	*P-value* = 0.04	*P-value* = 0.35	*P-value* = 0.00

SRC: Self-Referenced Competency, CE: Competitive Excitement, EE: Effort Expenditure
ORCR: Other Referenced Competency and Recognition, AP: Affiliation with Peers, PPI: Positive Parental Involvement
significant difference $p<0.05$
* significant difference found between NSSA and MSA
** significant difference found between MSA and SSSA
*** significant difference found between NSSA and SSSA

Table 4. *Effect Size for Significant Differences between NSSA, MSA, and SSSA within the SEYSQ Subcategories*

Pairwise Comparison		**Effect Size**							
		SRC	CE	EE	ORCR	AP	PPI	Intrinsic Overall	Extrinsic Overall
NSSA	MSA	NSD	0.77**	0.67**	0.74**	NSD	NSD	0.71**	0.54**
MSA	SSSA	0.37*	NSD	0.32*	NSD	NSD	NSD	NSD	NSD
NSSA	SSSA	0.62**	0.73**	0.99***	0.64**	0.4*	NSD	1.0***	0.57**

SRC: Self-Referenced Competency, CE: Competitive Excitement, EE: Effort Expenditure
ORCR: Other Referenced Competency and Recognition, AP: Affiliation with Peers
NSSA: Single-sport Athlete; MSA: Multi-sport Athlete; SSSA: Single-sport Specialized Athlete
NSD=No significant difference
* 'small' effect size
** 'medium' effect size
*** 'large' effect size

Except for PPI, no significant differences in sources of enjoyment scores or measures of intrinsic or extrinsic motivation were found between age groups (see Table 5). Comparisons between the 3 grades were made using a single-factor ANOVA test. Post hoc analysis was conducted using the Scheffe Method finding

that there was a statistically significant difference between 6th and 7th grade athletes and 7th and 8th grade athletes, but not between 6th and 8th grade athletes (see Table 6). Effect size was calculated for all variables that showed meaningful differences and classified, as defined by Cohen (1988), as: small d=|0.2|, medium d=|0.5|, and large d=|0.8|. It should be noted that while PPI was significantly lower for 7 graders compared to 6th and 8th graders, the Overall Extrinsic score was still statistically similar for all grades (p>0.05).

Table 5. *Grade Comparison within the SEYSQ Subcategories*

Intrinsic Categories				
	SRC	CE	EE	Overall Scores
	(highest score possible= 20)	(highest score possible= 20)	(highest score possible= 25)	(highest score possible= 65)
6th grade (n=94)	17.7 +/- 2.3	17.8 +/- 2.4	21.1 +/- 3.0	56.7 +/- 6.6
7th grade (n=40)	17.4 +/- 2.2	18.0 +/-2.2	20.5 +/-3.3	55.8+/-5.8
8th grade (n=172)	17.7 +/- 2.0	17.5 +/- 2.5	21.6 +/- 3.2	56.8 +/- 6.3
	P-value >0.05	*P-value* >0.05	*P-value* >0.05	*P-value* >0.05
Extrinsic Categories				
	ORCR	AP	PPI	Overall Scores
	(highest score possible= 30)	(highest score possible= 25)	(highest score possible= 20)	(highest score possible= 75)
6th grade (n=94)	23.1 +/- 5.2	21.0 +/- 3.3	17.2 +/- 3.2	61.3 +/- 9.1
7th grade (n=40)	22.9 +/-5.1	20.6 +/-3.2	15.3+/- 3.9	58.8 +/-9.8
8th grade (n=172)	22.6 +/- 5.2	21.1 +/- 3.4	16.8 +/- 3.3	60.5 +/- 9.3
	P-value >0.05	*P-value* >0.05	*P-value* =0.01*	*P-value* >0.05

SRC: Self-Referenced Competency, CE: Competitive Excitement, EE: Effort Expenditure
ORCR: Other Referenced Competency and Recognition, AP: Affiliation with Peers, PPI: Positive Parental Involvement
*Significant differences found between 6th and 7th grade and 7th and 8th grade

Table 6. *Effect Size for Significant Differences between 6th, 7th, and 8th Grades within the SEYSQ Subcategories*

Pairwise Comparison		**Effect Size**							
		SRC	CE	EE	ORCR	AP	PPI	Intrinsic Overall	Extrinsic Overall
6th grade	7th grade	NMD	NMD	NMD	NMD	NMD	0.54**	NMD	NMD
6th grade	8th grade	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
7th grade	8th grade	NMD	NMD	NMD	NMD	NMD	0.41**	NMD	NMD

SRC: Self-Referenced Competency, CE: Competitive Excitement, EE: Effort Expenditure
ORCR: Other Referenced Competency and Recognition, AP: Affiliation with Peers
NSSA: Single-sport Athlete; MSA: Multi-sport Athlete; SSSA: Single-sport Specialized Athlete
NSD=No meaningful difference
* 'small' effect size
** 'medium' effect size
*** 'large' effect size

Discussion

This study aimed to quantify the amount and sources of sport enjoyment, using the SEYSQ, among adolescent athletes and assess differences between NSSA, MSA, and SSSA as well as age groups. Results (total SEYSQ scores and subscale scores) indicated significant differences between NSSA and MSA/SSSA on several measures of sport enjoyment. MSA and SSSA both rely on intrinsic and

extrinsic sources of enjoyment for motivation in very similar ways; whereas NSSA are less motivated and experience less enjoyment from sport compared to MSA and SSSA.

There were no significant differences in total SEYSQ score between the youngest grade (6^{th} grade; mean age=11.8; standard deviation ± 0.5 years) and oldest grade (8^{th} grade; mean age=13.6; standard deviation ± 0.5 years) of athletes who participated in this study. Previous studies have suggested that sport engagement and enjoyment decrease as age increases among youth athletes (McCarthy et al. 2008, Berki and Piko 2017). However, the current study showed no significant difference between younger and older participants in terms of enjoyment.

McCarthy and Jones (2007) reported the significance of sport enjoyment to children in the sampling years (ages 7-12). Their findings point out that children experience sport enjoyment from intrinsic and extrinsic sources (McCarthy and Jones 2007). Similarly, this current study's findings show that youth athletes (ages 11-14 years) experience enjoyment from both intrinsic and extrinsic sources regardless of identifying as an NSSA, MSA, or SSSA. The present study expands on previous youth sport motivation research by exploring the differences in sport enjoyment between adolescent NSSA, MSA, and SSSA. In addition, this study also examines differences between younger and older adolescent athletes as well as males and females on measures of sport enjoyment and sources of sport enjoyment. Coaches of athletes in this age group may manage a mix of NSSA, MSA, and SSSA that often compete on the same teams or in the same leagues. The results from the current study show that NSSA scored lower in many of the SEYSQ subcategories compared to MSA and SSSA. More specifically, NSSA scored lower than SSSA in all subcategories except for PPI. Furthermore, NSSA had lower means scores than MSA and SSSA across all subcategories showing significant differences in the subcategories of EE, CE, and ORCR, respectively, when compared to both groups.

Based on the findings from the present study, coaches working with NSSA should strive to meet the psychological needs of their athletes and create an atmosphere that promotes self-determined motivation. Self-determined motivation can be met if the psychological needs of autonomy, competence, and relatedness are satisfied (Deci and Ryan 1991). Time devoted to sport participation may also be a factor. NSSA may be lower in the SEYSQ subcategories because less time is spent participating in sport than MSA and SSSA; thus, they do not associate as much enjoyment with sport compared to the other groups.

Parents, coaches, and trainers can influence motivation through interactional behavior with their athletes (Mageau and Vallerand 2003). Pensgaard and Roberts (2002) affirm that coaches have an essential role in creating a motivational climate for their athletes that promotes an atmosphere of mastery rather than performance outcomes and found that even elite athletes emphasize the role of the coach as "important in that he or she is supportive and builds confidence." Parents, coaches, and trainers of youth athletes can emphasize intrinsic motivation by creating a task-oriented climate ("encourages participants to perform an activity in order to improve their skills" (Vallerand 2007)) as opposed to an ego-involved climate

("leads athletes to believe they must outperform other athletes, including teammates" (Vallerand 2007)). Focusing on fun and challenging tasks can allow athletes to perform an activity for intrinsic reasons that may lead to more engaged action towards skill development, continued engagement in the sport, and increased enjoyment.

The results of this study are important for understanding the sources of enjoyment that impact intrinsic and extrinsic motivation in young NSSA, MSA, and SSSA; however, limitations exist. Participants in this study were all from the same geographical region (Western United States) and thus were exposed to sport through similar developmental sport programs. Consequently, the majority of the participants likely have similar sport backgrounds, limiting the study's external validity. The study was based on a convenience sample of student athletes. With that said, a limitation to the study is that not all age groups contain the same sample size.

Conclusion

The results of this study provide helpful information for those involved in youth sport development. Coaches need to focus on individual motivational needs to ensure all athletes experience improved competence and enjoyment. Specifically, implications of the results of this study suggest that to fit the needs of all the types of athletes and improve coaching, those involved in youth sport development programs should incorporate what already motivates these athletes into creating an environment that promotes excitement (CE) and focuses on the athlete or team performance rather than outcomes (SRC). Coaches, parents, and trainers of MSA and SSSA athletes should emphasize their hard work during practice, training, and competition (EE) and provide them with challenging tasks.

Future research in this area of study should include a more diverse geographical, ethnic, and socioeconomic sample of youth athletes. Research should also aim to examine how ability, number of years competing, and individual expectations affect the amount and sources of enjoyment in sport.

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An *Ex-Post* Analysis of the 2004 Olympic Effect

By Gregory T. Papanikos[*]

This paper evaluates the effects of the Olympic Games of 2004 hosted in Athens on Greece's Gross Domestic Product (GDP), as estimated in Papanikos (1999). The estimates were made in 1997 for a period of fourteen years, 1998-2011, based on various scenarios. During this period two events have had a great impact on GDP that could have been predicted in 1997. Firstly, Greece adopted the euro in 2002, and even though this was pretty much a possibility in 1997, but not of course a certainty, the most important effect of the euro would have come from its exchange value vis-a-vis major currencies of countries with Greece was trading. This included tourism. Despite what many economists thought at the time, the introduction of the euro was not accompanied by a devaluation, but by unprecedented overvaluation. This had a negative impact on Greek GDP. Secondly, the Great Recession hit the Greek economy hard starting in 2008. These two effects had a negative impact on Greek GDP, wiping out the expected positive effects of the Olympic Games.

Keywords: *Olympic Games, GDP, Athens 2004, euro, great recession*

Introduction

Hosting the Olympic Games has many effects on an economy. The effect on Gross Domestic Product (GDP), and therefore employment, is considered the most important one. In 1999, the Research Institute of Tourism (RIT) published a book which had estimates of the effect of Athens in 2004 on Greek GDP from 1998 to 2011 (Papanikos 1999). A summary is presented in Kartakoullis et al. (2003) and Papanikos (2020). The purpose of this short note is to provide an *ex-post* assessment of these estimates. It seems that the positive effect of hosting Olympic Games on GDP is through an increase in exports as has been demonstrated in Rose and Spiegel (2011). Also, Kasimati and Dawson (2009) found a positive effect on Greek economic growth during the preparation period as well as in the immediate post-Olympic period, but modest effects, if any at all, in the long-term. These studies are within the spirit of this study. I assume the positive effects and I also assume that the estimates made in my 1999 study were realized. This paper, then, aims to estimate the exact magnitude of the Olympic effect on Greek GDP.

The literature on the economics and other issues of Olympic Games is huge. I do not intend to present a review of this literature. A number of studies have been published in this Journal on various aspects of Olympic Games, and ATINER has published two books based on papers presented at its various conferences (Papanikos 2003, 2004a). One of these conferences was organized in collaboration with the International Association of Sports Economics (IASE) and the Panhellenic

[*]President, Athens Institute for Education and Research, Greece; Honorary Professor of Economics, University of Stirling, UK; and Professor, MLC Ljubljana, Slovenia.

Association of Sports Economists and Managers (PASEM). In what follows, I review some of these publications as an indication of the subjects covered under the rubric of Olympic Games studies.

In an interesting paper, Tomecka (2019) gives a different twist to the whole idea of Olympics and medals by connecting to the ancient concepts of good and brave. The idea of Olympic Games transcends sports as is perceived by the common man. It is an ideal that emphasize high spirits and values. This relates very much to the award of the Olympics Games of Athens in 2004 as representing the true spirit and value of Olympic Games.

Another topic of research has been the comparison between ancient and modern Olympic Games. Stefani (2017) compared the athletic performance of athletes in the ancient Olympic Games and modern games. The focus of the paper was on male-female differences in various periods of modern Olympic Games.

Cabralis et al. (2018) evaluated a sports administration training programme of the Trinidad & Tobago Olympic Committee (TTOC). Their finding was very encouraging because after almost two decades, the graduate of the programme held strategic sports administrator positions in various organizations. Many universities and organizations offer education programmes that relate to Olympic Games and this study is an example.

Costas (2017) is another study which emphasizes the education and training aspects of the Olympic Games legacy, but this time for the London Olympic Games and the sport of swimming for young children. The author emphasizes the pupil's voice, "… as a pedagogical approach to inform curriculum design."

Nicoliello (2021) examines the New Agenda of 2020+5 which was approved by the International Olympic Committee. This new strategic roadmap consisted of 15 recommendations. There is a call to "strengthen the uniqueness and the universality of the Olympic Games; foster sustainable Olympic Games; reinforce athletes' rights and responsibilities; continue to attract the best athletes; further strengthen safe sports and the protection of clean athletes; enhance and promote the Road to the Olympic Games; coordinate the harmonisation of the sports calendar; grow digital engagement with people; encourage the development of virtual sports and further engage with video gaming communities; strengthen the role of sport as an important enabler for the UN Sustainable Development Goals; strengthen the support to refugees and populations affected by displacement; reach out beyond the Olympic community; continue to lead by example in corporate citizenship; strengthen the Olympic Movement through good governance; innovate revenue generation models."

The most important of Olympic Games research is the economics of Olympic Games even though the social impacts should not be underestimated (Máté 2018). Bakkenbüll and Dilger (2020) did an economic study of the willingness of German people to host Olympic Games in their own country. Using the classical methodology of willingness to pay, they found that Germans were willing to pay 3.57 billion euro to host the games.

Kasimati (2015) has looked at the post-Olympic use of the Olympic venues of Athens since it was hosted there in 2004. She found that their utilization was slow

and ineffective. As she argued, years after the games the benefits from the venues are to be seen.

The paper is organized on five sections including this introduction. Section two presents and discusses the estimates of Papanikos' (1999) book. In the following section the realized GDP data are compared with the estimates, and as a result, an estimate of the Olympic effect is measured. Section four speculates how the Olympic Games of Athens 2004 could have benefitted more of the Greek economy and what policies were required to achieve this goal.

The Original *Ex Ante* Estimates

Table 1 reproduces the data as originally published in Papanikos (1999). The assumption made was that there were three types of expenditures: tourism, investment for the Olympic Games (direct) and administrative expenditures needed for the organization of the Olympic Games of Athens 2004. The last two had no effect after the game and only the tourism continued to contribute to GDP after the games. The assumption made was that these effects lasted till 2011.

Table 1. *Effect on GDP and Employment, 1998-2011 (Billions of Constant 1999 Drachmae)*

Year	Tourism (1.5)	Investment (1.8)	Organization (1.2)	GDPOG	GDPGROG (%)	EMPLOG (000s)
1998	62	0	1	63	0.2	7
1999	134	0	6	140	0.4	15
2000	211	0	12	223	0.6	23
2001	278	65	24	367	1	39
2002	369	130	48	547	1.4	57
2003	374	130	96	600	1.6	63
2004	436	65	269	770	2	81
2005	407	0	0	407	1.1	43
2006	322	0	0	322	0.9	34
2007	253	0	0	253	0.7	27
2008	170	0	0	170	0.4	18
2009	178	0	0	178	0.5	18
2010	93	0	0	93	0.2	10
2011	92	0	0	92	0.2	10
	3379	390	456	4225	11.2	445

Source: Papanikos (1999, Table 5, p. 112).

For each type of expenditure, it was assumed an *ad hoc* multiplier effect. The tourism multiplier was 1.5, the investment multiplier was assumed equal to 1.8 and the administration expenditures multiplier was the lowest and equal to 1.2 (in parenthesis in the table). All expenditures are in constant (1999) billions of drachmae. More than 60% of the administrative expenditures were realized during the year of the games, 2004. Employment was estimated using the average productivity in the service sector, which, in 1999, was equal to 9.5 million

drachmae. The employment issue at the microeconomic level is discussed in Papanikos (2004b).

According to the estimates of Table 1, the maximum effect of Olympic Games in terms of GDP growth was 2% in 2004. The accumulated growth rate of the 1998-2011 period was 11.2% or 0.8% per year.

Measured in units of the national currency at the time (i.e., drachmae), it was estimated that GDP would have grown by 4.2 trillion of drachmae during this period coming from tourism (3.4 trillion or 80%), from investment (0.4 trillion drachmae or 9.2%) and from organizational expenditures (0.5 trillion drachmae or 10.8%).

In terms of employment, the Olympic Games would have created 445,000 jobs during the 1998-2011 period.

The GDP growth rates of the Olympic effect are used in the next section to provide estimates of the ex-post GDP effect.

Ex-Post Estimates of the Olympic Effect

Table 2 uses the actual GDP data of the 1998-2011 period in billions of constant (2015) euro and the growth rates of the Olympic effect of the previous section to estimate the total GDP effect.

Table 2. *The Ex-Post Effect*

Year	GDP (Bn 2015 €)	GDPGR (%)	GDPGROG (%)	GDPOG (Bn Constant €)
1998	169.5	3.86	0.2	0.339
1999	174.7	3.07	0.4	0.6988
2000	181.6	3.95	0.6	1.0896
2001	189.1	4.13	1	1.891
2002	196.5	3.91	1.4	2.751
2003	207.9	5.80	1.6	3.3264
2004	218.4	5.05	2	4.368
2005	219.7	0.60	1.1	2.4167
2006	232.1	5.64	0.9	2.0889
2007	239.7	3.27	0.7	1.6779
2008	238.9	-0.33	0.4	0.9556
2009	228.6	-4.31	0.5	1.143
2010	216.1	-5.47	0.2	0.4322
2011	194.2	-10.13	0.2	0.3884
Total (1998-2011)		19.04	11.20	23.57
Average (1998-2011)		1.36	0.80	1.68

The total effect was 24 billion of 2015 euro or 1.68% per year. However, this is double the figure found in Table 1 and might be the result of two important events during the period under consideration.

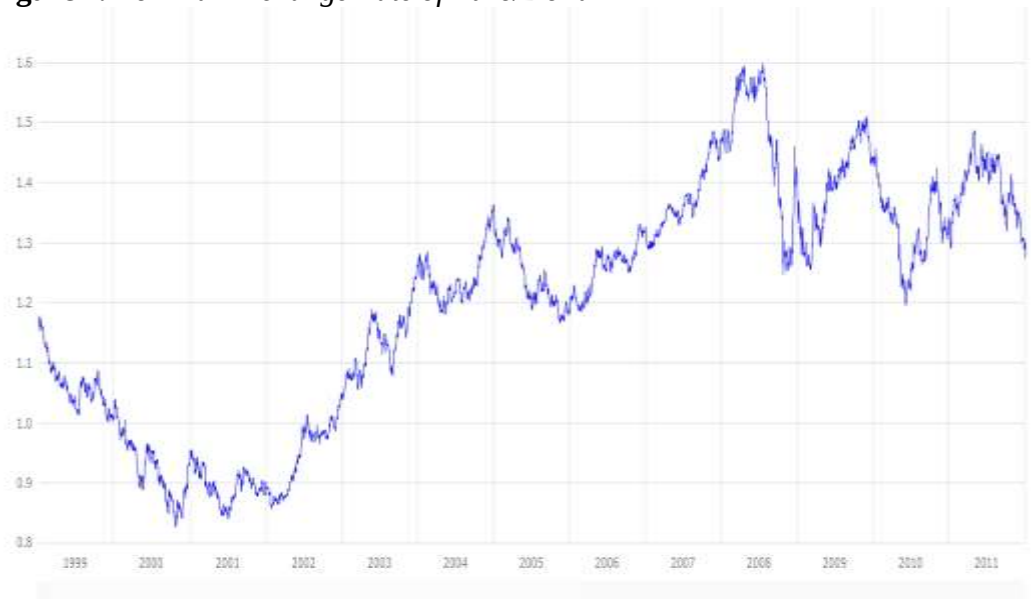
The Olympic effect on GDP is very difficult to measure because during this period, 1998-2011, two other very significant events happened which are assumed to have had very important and unprecedented effects in peace years.

Firstly, in 2002, Greece became one of the initial members of the Eurozone. I have analyzed this effect elsewhere, the ex-ante in Papadopoulos and Papanikos (1997, 2002) and the ex-post in Papanikos (2015a, 2022). I will not repeat the discussion here, but I should emphasize something that relates to the tourism effect.

International tourism expenditures are considered exports which is the effect that the study of Rose and Spiegel (2011) found as the most important effect of the Olympic legacy. However, this very much depends on the exchange rate. If there is an overvaluation (undervaluation) of euro, then the tourism effect, as had been estimated in Table 1, would have been lower (higher). For the estimates of the tourism effect, it was assumed that the exchange rate would have been relatively stable. However, as it turned out, it was far from stable.

Figure 1 shows the nominal exchange rate of units of US dollars required to buy one euro. In 2002, the first year of euro in actual circulation, less than one dollar was required to buy one euro. In the year of the Olympic Games in 2004, the euro reached record levels of overvaluation and fluctuated between 1.2 and 1.4 of a US dollar. The euro appreciated even further reaching the highest-ever rate of 1.6 dollars. Throughout the 2008-2011 period it remained at very high rates. This had a detrimental effect on Greek tourism.

Figure 1. *Nominal Exchange Rate of Euro/Dollar*



Source: European Central Bank.

Secondly, the Great Recession of 2008 hit Greece very badly. Never before in peace years did the Greek GDP decrease so much, as shown in Table 2. The last four years of the alleged Olympic effect, the Greek GDP was constantly declining at an increasing rate. In 2008 by 0.33%; in 2009 by 4.31%; in 2010 by 5.47% and

in 2011 by 10.13%. I have extensively researched the effects of the Great Recession on the Greek economy (see Papanikos 2015a-2015j, 2014a-c) and the main conclusion was that international factors and internal political developments can explain why the Greek economy was hit so hard, relative to the other Eurozone countries.

Neither of these two impacts could have been predicted in 1997. Most would have expected that the euro would have depreciated relative to the US dollar because of the uncertainly surrounding the new currency; the opposite happened during the time period under examination here. Of course, the Great Recession, and primarily the extent of its effect, could not have been predicted in 1997 with the information available at the time.

The Benefits from Hosting Olympic Games

It is true that Athens was transformed because of the Olympic Games of 2004. New infrastructure was built which has had a permanent effect on people's lives. The new airport, metro system, ring roads and many other such major improvements have increased the quality of living in the city. Consequently, this has increased the attractiveness of the city and more tourists are coming because of that. Ziakas and Boukas (2014) did a study using qualitative data obtained from semi-structured interviews of nine city officials and tourism administrators whom concluded that it is not too late to implement post-event leveraging. They recommend the development of a strategic framework which combines sports and culture.

The above emphasis on marketing the legacy of the Olympic Games (as is also explained in Kartakoullis et al. (2003)) does reflect the actual process of how the Games can have a positive effect. The marketing tool is the Games themselves and the world publicity it generates. This positive image is materialized as an economic (GDP) effect through tourism and exports of Greek products. The latter should reflect the culture and the ideals of the spirit of the Games. Selling wine and olive oil in the world market would not have been assisted by the Olympic Games of 2004. This is the reason I considered the international tourism arrivals as the most important and quite possibly the only long-lasting Olympic economic effect in my original study of 1999.

After all, the Olympic Games is not about only money. The economic effects are important, but Olympic Games have their own cultural value by promoting world peace by bringing the youth of the world together, and instead of fighting in the battlefields, they "fight" in the arenas of the Olympic Games.

Conclusions

Predicting the Olympic Games' economic effect is rather speculative. This paper analyzed the estimates of 1997 made by Papanikos (1999) of the Olympic Games of 2004 on Greek GDP for a period of fourteen years which started in 1998

and ended in 2011. In total, the GDP effect was found equal to 24 billion euro or 1.68 billion euro per year.

However, these effects should be interpreted with caution, because during the same period, the Greek economy was affected by two major events which have had lasting effects on Greek GDP. Firstly, the introduction of the euro in 2002 and its erratic behavior of its value, vis-a-vis major currencies had a negative impact on Greek GDP. Secondly, the Great Recession hit the Greek economy hard during the last four years (2008-2011) of the fourteen-year period, which coincide with the last years of the Olympic effect on Greek GDP.

The above shows that long-term economic predictions are difficult to be made given that unforeseen factors may undermine any scenario. As such, this is the case of the current pandemic which also hit the Greek economy very hard, especially its tourism sector, but this took place outside of the time framework of the Olympic effect.

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