RIVISTA DI
DIRITTO ED ECONOMIA DELLO SPORT

ISSN 1825-6678
Vol. II, Fasc. 1, 2006

'HISTORICAL EXCELLENCE' IN SOCCER WORLD CUP TOURNAMENTS: EMPIRICAL EVIDENCE WITH DATA FROM 1930 TO 2002

by Benno Torgler*

CLASSIFICATION JEL: L830

Introduction

The expansion of economics to other spheres of life, including politics, war, crime, religion, or sports, was according to Hirshleifer, "like a breath of fresh air"(p. ix).[1] With standard economic analyses new insights in these "non-market topics" have been developed. Several Nobel Prizes indicate that economists have successfully entered other territories. The economic analysis of soccer follows this path, showing how effective traditional economic tools are to analyze this sport. Compared to other "non-market economic topics", the investigation of sport events has several advantages:[2]

1) Reliability of data. Sports data have in general low variable errors. For example, the soccer ranking, teams' performance are clearly observa-

* BENNO TORGLER, Yale Center for International and Area Studies, Leitner Program in International & Comparative Political Economy, 34 Hillhouse Avenue, P.O. Box 208206, New Haven, CT 06520 (USA) and Center for Research in Economics, Management and the Arts (CREMA), Gellertstrasse 24, CH-4052 Basel (Switzerland). E-Mail: benno.torgler@yale.edu. For advice and suggestions thanks are due to Doris Aebi and Raul Caruso.

[1] J. HIRSHLEIFER, *Introduction*, in S. GROSSBARD-SHECHTMAN, C. CLAGUE (eds.), *The Expansion of Economics*, Towards a More Inclusive Social Science. New York, M. E. Sharpe, 2002.

[2] See, e.g., B. L. GOFF, R. D. TOLLISON (eds.), *Sportometrics*. Texas, Texas A&M University Press, 1990.

ble and are free of discrepancies compared to well known and often used traditional economic variables such as GDP or CPI.

2) Availability of data: A huge amount of data is now available. New technologies such as the Internet allow to collect data at lower costs, as many event organizers provide statistical data. For example, FIFA provides with their homepage a huge amount of statistical material.

3) A sport event is close to a field experiment. The soccer game takes place in a controlled environment. External influences are controlled through the rules (law) of the games. Thus, many factors can be held constant and the situation is much like a controlled environment. Even though a sport event allows social and economic interactions and is thus less controlled than a laboratory experiment, one of the main advantages is that the participation evokes actual and real processes in an environment outside a laboratory setting. Soccer players are professionals. Thus, their earnings and future value depend on their performance. On the other hand, laboratory experiments induce lower economic or financial incentive than a real sport event. They certainly have the great advantage that a specific situation can be designed and thus the variables of interest can be controlled for and manipulated. This allows to reduce causality problems and thus gives sound information not only about the relationship between two variables but also about the direction of the effect. On the other hand, working with some sport data (e.g., performance, ranking as dependent variables) may reduce endogeneity problems arising with field data.

However, empirical analysis in the area of sport is mainly done on North American sports. Thus, empirical investigations on the economics of soccer are still in their infancy. First pioneering works in the economics of soccer have been made in the 70s.[3] Fruitful insights have been generated analyzing, e.g., the commercial structure, the competitive balance or the uncertainty of the outcome.[4] Changes in the rules also offer new investigation grounds. For example, the Bosman rule allowed to better observe migration tendencies of players. However, studies that go beyond the club level are rare.[5] The stu-

[3] See, e.g., P. Sloane, P., *The Economics of Professional Football: The Football Club as Utility Maximiser, Scot. J. Pol. Ec.*, vol. 17, 1971, 121-146.

[4] For a detailed overview see, e.g., S. Dobson, J. Goddard 2001, *The Economics of Football*, Cambridge, Cambridge University Press, 2001

[5] For exemptions, see R. Hoffmann, L. Chew Ging and B. Ramasamy, T*he Socio-Economic Determinants of International Soccer Performance, J. Appl. Ec.*, vol. 5, 2002a, 253-272; R. G. Houston, Jr., D. P. Wilson, *Income, Leisure and Proficiency: An Economic Study of Football*

dies of Hoffmann et al. and Houston and Wilson are an exception. Both analysed the determinants that have an impact on the success of national teams working with the *FIFA World Ranking*. The Hoffmann et al. paper investigated the importance of country-inherent factors such as culture, demography and geography on international soccer performance and reveal that these factors are important. For example, they observe inverted U-shape relationships with respect to temperature and per-capita wealth. Thus, when GNP per capita exceeds a certain optimal level, any additional increases lowers the soccer performance. The study locates the optimal level at US$ 21'836, which is slightly less than the values for most of Western European countries that time. The inverted U-shape temperature curve shows that the maximum performance is when the deviation of the average temperature from 14 degrees is zero. Interestingly, the authors also find that the population size has no impact on soccer performance if a country has no Latin origin. On the other hand, Houston and Wilson's main interest is to investigate the influence of income on the proficiency of leisure as measured by international soccer achievements. The study find empirical support that leisure proficiency on an aggregated level is positively correlated with income, but increasing at a decreasing rate. Thus, they find support for the law of diminishing marginal productivity and provide additional evidence for the literature on consumption of leisure.

However, the disadvantage is that the *FIFA World Ranking* system covers only eight years. The evaluation also started quite late (mid 1993), which reduces the possibility to go back in history till the beginnings. Our analysis is the first to go back to 1930, when the first World Cup was held. Furthermore, we will focus on teams' performance during the World Cup, not on their overall results. Thus, our dependent variable measures the *historical excellence* at the FIFA World Cup final tournament. Torgler's *Kyklos* paper, on the other hand takes only a look at the FIFA World Cup 2002. However, contrary to previous studies, the paper analyzes the determinants of success during a game. The paper investigates whether home advantage matters, whether the strength of a team has a strong impact on the probability of winning and integrated also the referee in the economic analysis, an actor that has not been investigated so often in the past. Torgler found that that the strength of a team measured with the FIFA World Ranking does not play the important role one would assume, which indicates that the

Performance, Appl. Ec. Let.s, vol. 9, 2002, 939-943; B. Torgler, *The Economics of the FIFA Football Worldcup, KYKLOS*, 57, 2004, 287-300; B. Torgler, *The Determinants of Women's International Soccer Performances*, forthcoming in: *Int. J. Sport Man. Mark.*, 2006.

element of uncertainty is working. Furthermore, the results reveal that being a hosting nation has a significant impact on the probability of winning a game. Being at home increases the probability of winning by 45 percentage points. This is remarkable, taking into consideration the low FIFA ranking of Korea (40) and Japan (32) before this competition. The findings also indicate that the influence of a referee on the game result should not be neglected. Having a referee from the same soccer region has a positive impact on the probability of winning a game. Thus, the FIFA should avoid cultural closeness between a referee and a team, reducing situations in which the referee and one of the teams come from the same soccer region, a case that has been observed in 17.5 percent of the games in 2002. In the second paper forthcoming in *International Journal of Sport Management and Marketing*, Torgler takes into consideration the growing recognition of women's effort and spectators' interest in women's soccer performance, and thus with the Women's World Ranking system (WWR) investigates the determinants of success. This paper as a novelty reports empirical evidence of women's team performances with the main aim to investigate to which extent soccer tradition matters. Strong support has been found that women national teams with a stronger soccer tradition perform better. To check the robustness of the results, the paper uses several proxies such as having hosted a World Cup, the all-time World Cup Ranking, whether a nation has won a World Cup, taking into account men's soccer experiments due to the short history of women's performance. Furthermore, the paper investigates whether there is a correlation between women and men's team performances, using the men's FIFA/Coca-Cola World Ranking as a proxy. All estimations indicate that a stronger soccer tradition leads to higher team performances, and that there is a strong correlation between women and men's performances in soccer.

The World Cup has become a great spectacle and one of the world's biggest sporting events, being broadcasted in 2002 in more than 200 countries and regions around the world, covering over 41'100 hours of programming and reaching an estimated 28.8 billion television viewers.[6] This enhances economists' interest to better understand the determinants of success. The paper thus investigates the determinants of *historical excellence*. The major aim is to check whether economic, demographic, climatic factors and especially soccer tradition have an impact on teams' performances. We will also see whether there is a consistency with previous studies. First we present the model and in a next step the empirical findings. The paper finishes with some concluding remarks.

[6] See FIFA Media Information, November 21, 2002, http://fifaworldcup.yahoo.com.

1. Setting an empirical model to measure World Cup soccer success

To investigate empirically the determinants of success in World Cup, we first present the empirical model. Equation (1) provides an overview of model and Table 1 summarizes the variables. The next subsections will provide a detail description of all the variables. The equation is estimated using the OLS technique and reads as follows:

$$POINTS_i = \beta_0 + \beta_1 GDP_i + \beta_2 (GDP_i)^2 + \beta_3 POP_i + \beta_4 TE \quad (1)$$

where *i* indexes the countries in the sample, GDP_i and its squared term capture the effect of wealth, POP_i and $TEMP_i$ denote countries' population size and the average temperature, and $TRAD_i$ is our indicator for soccer tradition and involvement in the FIFA. The independent variables go back as far as possible. However, for some variables it was not possible to go farther back than the 60s with the best available data sources. Nevertheless, taking averages that cover more than 40 years should give a representative picture four each country.

Table 1. Empirical Variables

Variables	Description	Source
$POINTS_i$ *(DEP. V.)*	Points made between 1930 and 2002	Brown and Morrison[7]
GDP PER CAPITA (GDPi)	GDP per capita (constant 1995 US$), AVERAGE YEARS 1960-2001	WDI 2003
POPULATION (POPi)	Total population ages 15-64, AVERAGE YEARS 1960-2001	WDI 2003
TEMPERATURE (TEMPi)	Representative country values, years 1961-1990	Mitchell et al.[8]
TRADITION (TRADi):		
HOST	Dummy variable (1=countries that have hosted a World Cup between 1930 and 2002)	FIFA homepage
YEARS FIFA	Number of years being a member of the FIFA (till 2002)	Goldblatt[9]
FIFA PRESIDENT	Two variables: 1) dummy variable (1=yes), 2) taking also into account the number of years being active as a president	FIFA homepage

Note: Word Development Indicators (WDI) are only available since 1960.

[7] G. Brown, M. Morrison (eds.), *2004 ESPN Sports Almanac*. New York, Hyperion, 2004.
[8] T. D. Mitchell, T. R. Carter, P. D., Jones, M. Hulme, M. New, A Comprehensive Set of High-Resolution Grids of Monthly Climate for Europe and the Globe: The Observed Record (1901-2000) and 16 Scenarios (2001-2100), cited.
[9] D. Goldblatt, *Soccer Yearbook 2003-4*, London, Dorling Kindersley, 2003.

Explanation of the dependent variable that measure the performance of national teams

The dependent variable of our study is the performance of national teams during the World Cup tournaments between 1930 and 2002. Victories between 1930 and 1990 were awarded with two points, the ones between 1994 and 2002 with three points (change in the rules). Table 2 presents the "all-time" World Cup Ranking table. It should be noted that "Germany" means "West Germany" from 1954-1990, the united country before and after that. We also used England to represent the United Kingdom, as it is the largest UK nation. This procedure is in line with previous studies.[10] Thus, Scotland, Wales, and Northern Ireland are excluded in the analysis and in Table 2, because several control variables such as, e.g., GDP per capita and population size are only available at the aggregated (UK) level. Furthermore, some data are unavailable for certain countries (North Korea, Iraq, East Indies, and Cuba). Thus, our sample covers 60 countries.

Table 2. World Cup Final Tournament Ranking 1930-2002

TEAM	POINTS
Brazil	141
Germany	123
Italy	96
Argentina	72
England	61
Spain	54
France	49
Sweden	42
Russia	41
Yugoslavia	40
Uruguay	40
Netherlands	37
Poland	34
Hungary	33
Mexico	33
Belgium	30
Austria	28
Czech Republic	27
Romania	21
Chile	20
Denmark	18
Paraguay	18
South Korea	17
Cameroon	16

[10] See R. Hoffmann, L. Chew Ging and B. Ramasamy, T*he Socio-Economic Determinants of International Soccer Performance,* cit.; B. Torgler, *The Determinants of Women's International Soccer Performances,* cit.

TEAM	POINTS
USA	16
Portugal	15
Switzerland	15
Turkey	15
Bulgaria	14
Croatia	13
Ireland Republic	12
Peru	11
Nigeria	9
Colombia	8
Costa Rica	8
Morocco	8
Senegal	8
Japan	7
Norway	7
South Africa	6
Algeria	5
Saudi Arabia	5
Tunisia	5
Iran	3
Jamaica	3
Ecuador	2
Egypt	2
Honduras	2
Israel	2
Australia	1
Bolivia	1
Kuwait	1
Canada	0
China PR	0
El Salvador	0
Greece	0
Haiti	0
New Zealand	0
Slovenia	0
UAE	0
Zaire	0

Notes: Not included in the table are Scotland (15 points), Wales (5 points), Northern Ireland (11 points), North Korea (3 points), Iraq (0 points), Cuba (3 points) and East Indies (0 points). Source: Brown and Morrison.[11]

An overview of the independent variables

GDP per capita as a proxy for wealth or development

In wealthier countries, people have the tendency to spend more time and resources on leisure activities such as, e.g., soccer.[12] Houston and Wilson argue that income changes affect both, the amount of time and the amount

[11] G. Brown, M. Morrison (eds.), *2004 ESPN Sports Almanac*. New York, Hyperion, 2004, p 748.

[12] G. Houston, Jr., D. P. Wilson, *Income, Leisure and Proficiency: An Economic Study of Football Performance,* cit.

of additional resources used in the pursuit of leisure activities. For example, between 1987 and 1995 the annual payroll of commercial sports, recreation services and miscellaneous amusements has doubled in the US. On the other hand, the number of hours worked by typical workers has steadily fallen. Thus, these countries are more likely to perform better. They have a better infrastructure (physical and organizational), a better access to equipments, and spare time. Young soccer talents can therefore be better fostered. However, previous studies on soccer[13] and Olympic Games[14] have empirically found diminishing returns, which means that the success increases with per-capita wealth, but at a decreasing rate. Hoffmann, Ging and Ramasamy point out that soccer is a relatively capital-unintensive sport, which opens opportunities for children from under-privileged backgrounds. Furthermore, young talents in countries with a higher GDP per capita have more substitute leisure possibilities (e.g., more indoor activities such as electronic entertainments). Houston and Wilson's model assumes that a nation's proficiency in leisure is a function of nation's level of human capital, the leisure time consumption and the infrastructure in place to develop leisure skills. The time dedicated to leisure is a function of income and the preference for each given leisure activity. The greater the *time* available to purse *leisure* activity, the more *proficient* someone can become. Furthermore, as leisure is usually assumed to be a normal good, the first-order effect suggests a positive effect between *income* and *leisure time*. The law of diminishing marginal returns suggests that the second-order effect of *leisure time* on *leisure proficiency* is negative as the gains in proficiency diminish with additional increases in leisure time allocation. On the other hand, the second-order effect of *income* on *leisure time* is uncertain. It can be positive or negative. Their results indicate that second-order effect of *income* on *leisure proficiency* is negative and statistically significant. Any increase in the time and resources invested in soccer are likely to yield progressively smaller returns to performance. These results also implies that the second-order influence of income on leisure is also negative, providing indirect evidence that the consumption of leisure increases at a decreasing rate across higher level of income. This makes it relevant to consider a quadratic relationship between performance and the GDP per capita and to check whether the results are robust using a different data set.

[13] G. Houston, Jr., D. P. Wilson, cit.; R. Hoffmann, L. Chew Ging and B. Ramasamy, *The Socio-Economic Determinants of International Soccer Performance,* cit.

[14] Hoffmann, R., L. Chew Ging, B. Ramasamy, *Public Policy and Olympic Success, App. Ec. Let.*, 9, 2002b, 545-548.

Population as a proxy for the potential pool of soccer talents

Countries with a bigger population have a greater pool of potential soccer talents.[15] Thus, a higher population increases the probability of having individuals with a higher ability to play soccer.[16] Houston and Wilson looking at soccer and Hoffmann, Ging and Ramasamy focusing on Olympic Games found a positive correlation between success and the size of population. However, Hoffmann, Ging and Ramasamy's soccer study did not find that the size of a country's population has a significant impact on men's soccer performance. They argue that populous countries such as China, India, and the USA are not so successful in men's soccer. Torgler's soccer study on women's performance on the other hand found that the size of the population has a statistically significant impact on women's international performances.

Temperature as a restriction

Geographical conditions of a country might have a strong impact on teams' performances. Climatic extremes (very high or low temperatures) have a negative impact on outdoor sporting activities such as soccer. Thus, the incentive for young sporting talents to perform under these conditions decreases. Hoffmann, Ging and Ramasamy found that the optimal average temperature for Olympic success is around 15° Celsius. The results indicate that climatic factors are significant. In their soccer study, Hoffmann, Ging and Ramasamy used the squared deviation from the 14-Celsius as a variable and found that the coefficient was statistically significant at the 10%-level. Both studies use the annual Celsius temperatures in capital cities. However, it might be relevant to use representative temperature values for the whole country, as Soccer is played everywhere and not only in the capital. Especially youngsters play in regional leagues. Furthermore, in many countries temperatures vary between regions. Thus, contrary to previous studies, we take representative country values.[17] To increase the representativeness of the data we use the averages for the years 1961 to 1990. This also takes into consideration that temperature affects potential talents over a longer period than one year. Torgler's study shows that temperature has an impact on women team's success, but contrary to the study by Hoffmann, Ging and

[15] It should be noted that in our data set there is a negative, but low correlation between the population size and the GDP per capita (below -0.1).

[16] G. Houston, Jr., D. P. Wilson, *Income, Leisure and Proficiency: An Economic Study of Football Performance*, cit.; R. Hoffmann, L. Chew Ging and B. Ramasamy, cit.

[17] T. D. Mitchell, T. R. Carter, P. D., Jones, M. Hulme, M. New, A Comprehensive Set of High-Resolution Grids of Monthly Climate for Europe and the Globe: The Observed Record (1901-2000) and 16 Scenarios (2001-2100), unpublished manuscript, Tyndall Centre, 2003.

Ramasamy the coefficient is negative. A higher temperature reduces the success of women's teams.

Soccer tradition as an engine of success

One of the major variables that we are going to analyze is countries' soccer tradition. It can be argued that soccer tradition should have a positive impact on the performance. To check the robustness, we will use several proxies:

JOINING THE FIFA AND FIFA PRESIDENCY

The popularity of soccer is different in each country that participates in the World Cup tournaments. This affects the time and resource spent for and the commitment towards soccer.[18] The years a nation has been a FIFA member may be a good proxy for the degree of soccer tradition and thus the popularity of the sport. Countries such as Germany, France, Spain, the Netherlands, Italy, or England were among the first members of the FIFA (the first four 100 years ago, the last two one year later). However, Houston and Wilson found a positive correlation between this variable and the performance, but the coefficient was not statistically significant.

Apart from popularity and tradition, involvement in the FIFA may capture also a kind of institutional bias.[19] Countries with a longer tradition in soccer could have more power in setting the rules of the game. FIFA is the governing body of soccer and it is possible that more powerful federations can influence the tournaments. The there is a large literature devoted to the topic of incumbency in politics.[20] The president of the FIFA has a lot of power in influencing the rules of the game. *Forbes* stresses that the presidency has become the "all-powerful center" of FIFA.[21] Paul Maidment, the author of the article stresses that the small cabinet of advisors and the lack of transparency and accountability allows to consolidate the presidents' policy and power base and circumvent its executive committee. Thus, we include a variable capturing whether a country had a FIFA president in the past. To check the robustness, we are also going to include a variable that measures

[18] Houston, Jr., D. P. Wilson, *Income, Leisure and Proficiency: An Economic Study of Football Performance,* cit.

[19] I am thankful to Raul Caruso for providing this point.

[20] See, e.g., S. D. Levitt, C. D. Wolfram, *Decomposing the Sources of Incumbency Advantage in the U.S. House, Leg. St. Quart.*, 1997, vol. 22, 45-60; G. King, A. Gelman, *Systemic Consequences of Incumbency Advantage in U.S. House Elections, Am. J. Pol. Sc.*, vol. 35, 1991, 110-138; M. Krashinskya, W. J. Milne, *The Effects of Incumbency in U.S. Congressional Elections, 1950-1988, Leg. St. Quart.*, vol. 18, 1993, 321-344.

[21] Forbes, *FIFA's Penalty Kick*, 05.27.02, by Paul Maidment, www.forbes.com/2002/05/27/0527fifa.html.

also the number of years a country had a FIFA president.

HOSTING A WORLD CUP TOURNAMENT

Hoffmann, Ging and Ramasamy point out that most of the nations, which have hosted a tournament, have a strong soccer tradition. In 11 out of 17 World Cups, the host team was among the top four teams.[22] The authors found that the variable is statistically significant at the 10% level. Similarly, as mentioned in the introduction Torgler's two studies indicate that being at home strongly increased the probability of winning the game in the World Cup 2002, and has a strong impact on the success of women's soccer teams. In general, hosting a World Cup is an indicator that a nation has a strong cultural affinity towards soccer.[23] We will use a dummy variable (HOSTING IN THE PAST =1) to consider whether a nation has been a hosting nation.

2. Overview and discussion of the empirical results

Table 3 presents the results. We also estimate *beta* or *standardized* regression coefficients. This allows to compare the magnitude and thus helps to see the relative importance of the used variables. We first consider the soccer tradition proxies in three different estimations (see Eq. 1 to 3). All three coefficients are positive and statistically significant. However, HOSTING A WORLD CUP has the stronger impact on team's performances, followed by YEARS IN FIFA and FIFA PRESIDENT[24]. The independent variables in Eq. 3 account for 45% of the variances in the points obtained during the tournaments, compared to 26% and 24% in Eq. 1 and 2. As a second possible the dependent variable, we use the ranking rather than the points. The results are similar. All coefficients are highly statistically significant. The t-statistic of the variable FIFA PRESIDENT strongly increases from 1.78 to 3.78, thus being statistically significant at the 1% level. Instead of using the dummy FIFA PRESIDENT we consider a second variable that takes also into account the number of years a country had a FIFA present. This allows to measure the length of the influence. The results remain robust. Using points as dependent variable, the coefficient reports a t-value of 1.81 with the highest beta coefficients among all variables (0.422). In the estimation using the ranking

[22] However, it should be noticed that in recent years also nations without a strong soccer tradition such as USA (1994) or Japan/Korea (2002) hosted World Cup tournaments.

[23] Houston, Jr., D. P. Wilson, cit.; R. Hoffmann, L. Chew Ging and B. Ramasamy, *The Socio-Economic Determinants of International Soccer Performance,* cit.

[24] Another possibility would be to use the ranking as dependent variable. The results are similar. Both coefficient are highly statistically significant in all three equations.

rather the points the t-statistic also increase from 1.81 to 3.63.

Subsequently, we present in Eq. 4 the result for a fuller specification. Eq. 4 has the obvious advantage of presenting a more balanced view of the role of different soccer traditional variables separating the effects of the independent variables. Because of a correlation (0.37) below the critical values, we can use two sets of variables in the same estimation. Both factors remain highly significant with a higher *beta value* for HOSTING A WORLD CUP. The strength of these two variables can also be investigated using a Wald-test for coefficient restrictions to test for *joint* significance. Not surprisingly, the *F*-statistic (10.5) and the corresponding *p*-value (0.0001) show that the null hypothesis is rejected at the 1% significance levels, which means that soccer tradition has a significant effect on a country's soccer performance during the tournaments. We also included the HOSTING A WORLD CUP together with FIFA PRESIDENT. The results indicate that the coefficient of HOSTING A WORLD CUP remains highly statistically significance. On the other hand, the coefficient FIFA PRESIDENT loses its statistical significant. Nonetheless, testing for joint significance reveals that as a group the variables are highly statistically significant (*F*-statistic= 8.72 and the corresponding p-value = 0.0005). Similar results are obtained when considering the number of years a country had a FIFA president (*F*-statistic of 8.12). Interestingly, if we take the ranking as dependent variable and not the points, the single coefficients of the FIFA PRESIDENT and the years of FIFA presidency are highly statistically significant (t=2.43, respectively t=2.12). However, the variable HOSTING A WORLD CUP has still higher *beta* values.

Thus, these results support that soccer tradition strongly affects the performance of the national team. Furthermore, it cannot be excluded that these findings also indicate not only popularity and tradition, but also a possible institutional bias that strongly influences the performance. More power in setting the rules of the game leads to a stronger team performance.

TEMPERATURE is statistically not significant, and switches the sign. Thus, it seems that the temperature of a country does not affect tournament performances. We also used the squared deviation from the 14-Celsius. However, contrary to previous findings, the coefficient is not statistically significant either, but shows also a positive tendency. Thus, the performance is not affected by geographical conditions of a country. It is still open whether the results change if we use the temperature of the capital city rather than representative country values. As these findings are not consistent with the previous studies, more work needs to be done to really see whether tempe-

rature affects the performance in the long-run and whether some previous results are sensitive to the way temperature has been measured.

The coefficient GDP PER CAPITA is positive and statistically significant. The results support the hypothesis that an increase in countries' wealth will enhance soccer performances. On the other hand, the second-order effect of wealth is negative and statistically significant. Thus, in line with previous studies we observe diminishing marginal returns. An increase in wealth, which should go in line with an increase in available time and resources dedicated to soccer, is likely to yield progressively smaller returns of success. The relationship between success and wealth is quadratic and best described as an inverted U-shape. This brings up the interesting question about the optimal level of wealth. In our study the optimal level is 18'980 US$ per capita. Belgium, France and the Netherlands are the countries closest to this optimal level, followed by other Western European and the Northern American countries (Canada and USA)[25].

Table 3. Determinants of Performances

Dep. Var.: Points	Coeff.	*Beta*	t-value	Coeff.	*Beta*	t-value	Coeff.	*Beta*	t-value	Coeff.	*Beta*	t-value
	Eq. 1			Eq. 2			Eq. 3			Eq. 4		
a) Soccer Tradition												
YEARS IN FIFA	0.590***	0.508	3.31							0.352***	0.304	3.2
FIFA PRESIDENT				44.296*	0.430	1.78						
HOSTED A WORLD CUP							42.927***	0.654	3.74	36.998***	0,563	3.53
b) Restrictions												
TEMPERATURE	0.464	0,132	0.69	-0.399	-0.114	-0.98	-0.259	-0.074	-0.58	0.227	0.065	0.44
c) Wealth/ Development												
GDP per capita	0.002**	0.608	2.22	0.002*	0.676	1.94	0.001*	0.396	1.69	0.001*	0.414	1.92
(GDP per capita)^2	-6E-08**	-0.571	-2.29	-7.27e-08**	-0.723	-2.02	-5E-08**	-0.507	-2.38	-5E-08***	-0.539	-2.79
d) Potential Pool												
POPULATION	1.00E-08	0.044	0.36	0.000	0.028	0.25	-4.00E-09	-0.02	-0.28	-2.00E-09	-0.009	-0.13
Number of observations	60			60			60			60		
Prob > F	0.000			0.011			0.000			0.000		
R-squared	0.260			0.238			0.445			0.503		

Notes: Robust standard errors. In the reference group is NOT HAVING HOSTED A WORLD CUP, NOT HAVING A FIFA PRESIDENT IN THE PAST. Significance levels: * 0.05 < p < 0.10, ** 0.01< p < 0.05, *** p < 0.01.

Eq. 1 to 4 indicate that the coefficient of POPULATION is not statistically significant. This is not a surprise, given the strong performances of countries

[25] The optimal level has been evaluated isolated from other factors. The exact position of the inverted U-shape curve certainly depends also on the values of other independent variables.

with a small population size such as Belgium, The Netherlands, Sweden, or Portugal. However, it may be worthwhile to interact POPULATION with a cultural variable, as Hoffmann, Ging and Ramasamy did. They found that the interaction with the culture variable *Latin* (covering the countries in Central and South America, Portugal and Spain and thus the *Luso-Hispanic* culture) was statistically significant. They point out that in these countries soccer has a high popularity. Latin countries have been very successful in the World Cup tournaments. In 13 out of 17 World Cups, Latin nations have been among the 3 best tournament teams, and 9 times they won the competition. Uruguay hosted and won the first tournament. Brazil is the only country that won the tournament 5 times. The Spanish soccer league is one of the best in the world, a great number of superstars playing in clubs such as Real Madrid or Barcelona. The two teams are also record holders of *European* cups (Real) and *European Cup-Winner* cups (Barcelona). In other countries soccer may have to compete more strongly with other sports. Thus, a bigger population size does not go in line with a stronger performance, as more *potential* soccer talents are active in other sports. Furthermore, a high level of income inequality often characterizes these countries. Soccer offers the opportunity for underprivileged children to improve their social status. In the next estimation presented in *Table 4* we therefore build the interaction term POPULATION * LATIN.

Interestingly, the interaction term is also statistically significant. The *beta* coefficient has the highest value among all independent variables. It implies that the population size has the strongest impact on soccer success if it is a country of LATIN origin. Eq. 5 indicates that an increase in the population size relative to the non-LATIN population would have a substantial impact on success of countries with LATIN origin. Hoffmann, Ging and Ramasamy stressed that income inequality may explain such a result. Thus, in order to examine the robustness of the result we include income inequality in Eq. 5. To measure the variable income inequality as a GINI index that measures the inequality in the distribution of income within countries[26], we use the newest available data set, ESTIMATED HOUSEHOLD INCOME INEQUALITY (EHII), constructed by Galbraith and Kum[27] using mean values of the whole available data set (averages between 1963 and 1999). The results indicate that higher inequality leads to a lower performance.

[26] The Gini index assumes values between 0 and 100. The higher the values the higher the income inequality.

[27] J. Galbraith, J. K., H. Kum, *Estimating the Inequality of Household Income: Filling Gaps and Fixing Problems in Deininger & Squire*, UTIP Working Paper No. 22, October, 2003.

However, the coefficient was not statistically significant. On the other hand, the interaction term remained statistically significant (t=2.93) with a *beta* coefficient of 0.472. Thus, even after controlling for the level of income inequality, the Latin culture effect remains robust.

Table 4. Performances and Potential Pools

Dep. Var.: Points	Coeff.	**Beta**	t-value
	Eq. 5		
a) Soccer Tradition			
YEARS IN FIFA	0.412***	0.355	3.32
HOSTED A WORLD CUP	28.546***	0.435	3.22
b) Restrictions			
TEMPERATURE	0.221	0.063	0.50
c) Wealth/Development			
GDP per capita	0.001	0.264	1.32
$(\text{GDP per capita})^2$	-4E-08**	-0.406	-2.03
d) Potential Pool			
POPULATION	-2E-08*	-0.069	-1.70
POPULATION* LATIN	7E-07***	0.457	2.84
e) Culture Region			
LATIN	-20.121***	-0.319	-3.34
Number of observations	60		
Prob > F	0.000		
R-squared	0.644		

Notes: Robust standard errors. In the reference group is NOT HAVING HOSTED A WORLD CUP, NON LATIN COUNTRIES. Significance levels: * $0.05 < p < 0.10$, ** $0.01 < p < 0.05$, *** $p < 0.01$.

3. Summary of the results and some concluding remarks

Soccer is an area of research that has been receiving increased attention in the last few years.

Especially a macro-economic approach, focusing on cross-country differences in sporting achievements is lacking. Surprisingly, little research has been conducted on what influences success in the FIFA World Cup final tournaments. There are some studies that used the FIFA ranking as measurement of performance. Thus, according to the author's knowledge the *historical excellence* between the years 1930 and 2002 has not been analyzed before. Strong support has been found that soccer popularity and tradition have a significant impact on teams' performances. Robustness has been analyzed using several different proxies. All coefficients are highly significant showing relatively high *beta* coefficients. However, apart from

popularity and tradition, involvement in the FIFA also captures institutional biases. Countries with a longer tradition in soccer have more power in setting the rules of the game. The results support that this power leads to a stronger performance among those countries which were longer involved in the FIFA or had a FIFA president in the past.

We also observed that greater wealth leads to a higher performance, but the success is subject to the "law of diminishing marginal return". Thus, performance increases at a decreasing rate. This is in line with previous studies. An increase in wealth, which should go in line with an increase in available time and resources dedicated to soccer, is likely to yield progressively smaller returns of success. The relationship between success and wealth is quadratic and best described as an inverted U-shape. In our study the optimal level is 18'980 US$ per capita. Belgium, France and the Netherlands are the countries closest to this optimal level, followed by other Western European and the Northern American countries (Canada and USA). Houston and Wilson argue that such a result also provides evidence that the *consumption of leisure* on an aggregate level also increases at a decreasing rate with increases in income.

On the other hand, temperature did not affect teams' tournament performances, which is not in line with previous studies. Thus, the performance is not affected by geographical conditions of a country. It is still unclear whether the results change if we use alternative proxies (e.g., temperature of the capital city rather than representative country values) and whether previous studies remain robust when using the representative country values. However, the Torgler's work on women's soccer performance showed an impact, but negative, using also the average country temperature. In sum, these inconsistencies show that more work has to be done to better see the impact of temperature on soccer performances.

The population size had only an impact on soccer success if a country is of Latin origin. The larger the population size for a country with Latin origin, the more points the national team wins in tournaments. The interaction term even remains statistical significant after controlling for income inequality. Thus, our results show that the Latin culture effect remains robust after controlling for the level of income inequality.

Future tournaments will allow to gain more observations and more statistical data to investigate more in depth one of the greatest spectacles and biggest sporting events around the world. Furthermore, more research has to be done to understand the economics of soccer tournaments. There are many unexplored aspects that might be interesting to investigate. For

example, for law and economics scholars, rules changes such as changing the reward in contest are highly interesting. For example, in the 90s the three-point rule has been introduced. It means that the winner of a match obtains three points and the loser zero points (one point for each team in case of a draw). Previously the winner of a match obtained only two points.