Determinants of European national men's football team performance: Scotland's potential progress in the UEFA Euro 2016 qualifiers

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Abstract:

In this paper, we estimate the potential outcomes for Scotland in the 2016 Euro qualifiers, based on a model of the outcomes of previous European men's football matches. The sampled dataset includes all matches played between European national men's football teams between August 2012 and December 2013, that is 368 matches in all. According to our model, Scotland should fail to progress to the UEFA Euro 2016 playoffs by only one goal in Group D. This result is confirmed when we correct our model to take into account the difference between real scores and scores provided by the model for each team in Group D. Nevertheless, in a third model – which is a better predictor – Scotland should come third in Group D and thus proceed to the playoffs in which it could hope to qualify for the Euro 2016 Finals. A fourth and final approach predicts that Scotland could even come second in Group D, behind Germany, and thus qualify directly to the UEFA Euro 2016 Finals in France.

I Introduction

The UEFA Euro 2016 Finals will take place in France and will be the first Euro Finals to include 24 teams. This increase in the number of teams provides more chances for some countries to take part in the Finals, including Scotland which has qualified only in 1992 (when 8 teams competed) and 1996 (when 16 teams competed). Indeed, in the 2016 Euro Finals instead of having only the teams ranked first in their groups plus the best second teams, all teams ranked first *and* second in their groups will qualify directly, plus the best third team across all groups, plus four other teams that will have beaten the four other third-ranked teams in the playoffs.

In this paper, we estimate the potential outcomes for Scotland in the 2016 Euro qualifiers, based on a model of the outcomes of previous European international men's football matches. The sampled dataset includes all matches played between European national men's football teams between August 2012 and December 2013, 368 matches in all.

The paper is structured as follows. In Section II we present our model. In Section III the data are described and in Section IV we report our results. In Section V we then apply these results to the forthcoming UEFA Euro 2016 qualifiers, with a focus on Scotland. In Section VI we note some limitations in the model and its resulting predictions. We conclude in Section VII.

II Model specification

In our model a score equation is specified and then estimated using variables identified in a review of the literature (Allan and Moffat, 2014; Andreff and Andreff, in press; Baur and Lehmann, 2007; Berlinschi, Schokkaert, and Swinnen, 2013; Gelade and Dobson, 2007; Hoffmann, Lee, and Ramasamy, 2002; Hoffmann, Lee, Matheson, and Ramasamy, 2006; Houston and Wilson, 2002; Leeds and Leeds, 2009; Macmillan and Smith, 2007; Yamamura, 2009, 2012). In addition, we introduce seven new variables which have not yet been tested as potential determinants of national men's football team performance. The relevant variables from the literature are:

- *Population*: $(Log\ POP_i - Log\ POP_j) / Log\ [min\ (POP_i, POP_j)]$,
  with POP_i the population of team *i*'s nation and POP_j the population of team *j*'s nation;
- *GDP per capita*: $(Log\ GDP_i - Log\ GDP_j) / Log\ [min\ (GDP_i, GDP_j)]$;
- *Climate* ([temperature - 14°C]^2): $(CLI_i - CLI_j) / [min\ (CLI_i, CLI_j)]$;
- *Experience*: *EXP* equals the number of matches played by a country in its history, thus $(Log\ EXP_i - Log\ EXP_j) / Log\ [min\ (EXP_i, EXP_j)]$;
- *Percentage of players*: is the number of football players in a country (*PLA*) divided by its population: $[(Log\ PLA_i / Log\ POP_i) - (Log\ PLA_j / Log\ POP_j)] / min\ [(Log\ PLA_i / Log\ POP_i), (Log\ PLA_j / Log\ POP_j)]$.
  The expectation is that a large population is not sufficient as a precondition to perform in the football World Cup while the percentage of players within this population should be a crucial determinant of scores and wins;
- *Home advantage*: is a dummy equal to 1 if team *i* plays home, -1 if team *j* plays home.

In addition to the above variables drawn from the literature, we introduce seven new variables to test the determinants of the outcome of men's international football matches. They are:

- *Player Quality*: is the number of players who are on the roster of the 10 most valuable European football clubs and have been fielded in at least 20 games per season: $(PLQ_i - PLQ_j) / min\ (PLQ_i, PLQ_j)]$.
  The 10 most valuable clubs in Europe are Real Madrid, Manchester United, FC Barcelona, Arsenal, Bayern Munich, AC Milan, Chelsea, Juventus, Manchester City and Liverpool (more than \$650m for every team against \$520m for the 11th (i.e. Tottenham); Forbes, 2013). The underlying assumption is that best players have an incentive to play in those teams with the best financial resources to pay them;
- *Foreign Managers:* from the core group of western European countries: $FOM_i - FOM_j$,
  with *FOM* as a dummy: equal to 1 for countries with a national team coached by a foreign manager from Belgium, France, Germany, Italy or the Netherlands.
  This dummy is derived from Kuper and Szymanski (2012) who contend that the five above-mentioned western European countries have discovered the secret of football and all adhere to the basic tenets of rapid collectivised western European football.
- *Technology Transfer through managers*: $TTM_i - TTM_j$,
  with *TTM* a dummy equal to 1 for countries with a manager who has coached a team in Belgium, France, Germany, Italy or the Netherlands or has been trained himself / herself by a manager operating in one of these five countries (the dummy equals 0.5 if the club was in the second division);
- *Prize*: is a dummy equal to 1 if team *i* is favourite, -1 if team *j* is favourite in a match with sporting prize for the two teams.
  Sporting prize means that a team is in contention for a specific sporting prize:
  - winning the final (eg UEFA Euro Finals or FIFA World Cup)
  - a qualification to the next round of a Finals' competition
  - *first* rank (rather than the second) in the group stage in a Finals' competition (eg the FIFA World Cup) – even when being ranked second allows a team to qualify to the next round. As a first-ranked team it automatically faces a second-ranked team from another group in the next round, hence, to be first rather than second should allow a team to avoid a supposedly best team in the next round. It is notable that in the 2014 World Cup, every team ranked first in its group stage qualified into the round of 16.

A team is considered as favourite if there is a difference of 0.1 or more between the two opponents in betting odds. When betting odds are not available, dummies are allocated to teams only in those cases where an obvious favourite can be assessed.

- *Prize difference in favour of the favourite*: is a dummy equal to 1 if team *i* is favourite, -1 if team *j* is favourite when it occurs that the favourite team has a sporting prize whereas the underdog has no sporting prize.
- *Prize difference in favour of the underdog*: is a dummy equal to 1 if team *i* is the underdog, -1 if team *j* is the underdog the latter having a sporting prize whereas the favourite has no sporting prize.
- *No prize*: is a dummy equal to 1 if team *i* is favourite, -1 if team *j* is favourite in a match without a sporting prize.

A linear specification for the predicted score between team *i* and *j* is written as follows:

$$S_{ijtsd} = \beta_0 + \beta_X X_{ij} + \beta_Z Z_{ijt} + \beta_W W_{ijts} + \beta_K K_{ijtsd} + \varepsilon_{ijtsd} \qquad (1)$$

where:

S_{ijtsd} is the score of a match between team *i* and team *j* in year *t*, during the semester *s* and on day *d*, β_0 is an intercept term, β_X stands for the coefficients of explanatory variables X_{ij} which depend on team *i* and team *j* (Climate and Percentage of players), β_Z the coefficients of explanatory variables Z_{ijt} which depend on team *i* and team *j* in year *t* (Population and GDP per capita), β_W the coefficients of explanatory variables W_{ijts} which depend on team *i* and team *j* in year *t* and semester *s* (Player Quality), β_K the coefficients of explanatory variables K_{ijtsd} which depend on team *i* and team *j* in year *t*, semester *s* and on day *d* (Experience, Foreign Managers, Technology Transfer, Home advantage, Prize, Prize difference for the favourite, Prize difference for the underdog and No prize) and ε a stochastic error term.

III Data description

The sample used to test the above-specified model gathers together all game-specific data from August 2012 to December 2013 for European men's international football (368 observations); Montenegro is excluded from the sample since data about the number of players are missing. Data regarding Score, Experience, Percentage of players and Home advantage have been collected or calculated from FIFA sources; Population is available on the United Nations website; GDP per capita from the International Monetary Fund website; Temperature from the World Bank website; Player Quality from ESPN and Wikipedia; Foreign Managers and Technology Transfer from Wikipedia; and Prize, Prize difference for the favourite, Prize difference for the underdog and No prize from BetBase1. Table 1 exhibits descriptive statistics for the sample as a whole.

IV Results

The results are shown in Table 2. Population, Experience, Percentage of players and Prize difference in favour of the favourite team have a significantly positive impact at the 1% threshold. Player Quality, Home advantage and Prize a significantly have a positive impact at the 5% threshold. GDP per capita has a significantly *negative* impact at the 10% threshold, while all other variables are insignificant. Though the latter variables are not all significant, it is worth noting that using the same model applied to all the men's national football team matches *in the world* over the period 2011-2013 (2,854 observations), all variables are significant, save for Climate.

Table 1: Descriptive statistics.

Variable	Mean	Standard deviation
Abs Score	1.5897	1.4735
Population	16,054,388	25,967,538
Abs Log-population difference	0.1476	0.1599
GDP per capita	32,663	30,553
Abs Log-GDP per capita difference	0.1290	0.1034
Temperature	8.4674	4.3833
Abs Climate difference	30.22	123.33
Experience	536.36	225.93
Abs Log-experience difference	0.1059	0.1114
Percentage of players	7.4118%	5.2134%
Abs Percentage of players difference	0.0438	0.0377
Quality of players	1.9674	5.2167
Abs Quality of players difference	3.1087	6.2400
Foreign managers	0.1114	0.3146
Abs Foreign managers difference	0.1957	0.3967
Technology transfer	0.1780	0.3762
Abs Technology transfer difference	0.2826	0.4396
Home advantage	0.9565	0.2039
Abs Prize	0.5326	0.4989
Abs Prize difference / favourite	0.0978	0.2971
Abs Prize difference / underdog	0.0136	0.1158
Abs No prize	0.3315	0.4708

Table 2: Results.

Variable	Coefficient	p-value
Population	2.6291	0.0002
GDP per capita	-1.3179	0.0967
Climate	-0.0004	0.3879
Experience	2.1463	0.0198
Percentage of players	7.2387	0.0035
Player quality	0.0272	0.0452
Foreign managers	0.1632	0.3652
Technology transfer	0.0579	0.7449
Home advantage	0.6771	0.0368
Prize	0.3522	0.0254
Prize difference / favourite team	0.8107	0.0031
Prize difference / underdog	-1.4087	0.3240
No prize	0.0667	0.6348
Constant	-0.4867	0.1172
Observations	368	
Adjusted R^2	0.470	

Surprisingly, the absolute value of the coefficient for Prize difference in favour of the underdog is higher than those for Prize difference in favour of the favourite team and Prize. This would mean that the advantage for the favourite team is higher when it has no prize to defend. This is counter-intuitive as one would expect favourites to have a smaller incentive to play at their best level and thus one would expect their coefficient to be lower. It is worth noting that the results for Prize difference in favour of the underdog could be biased by one score difference: that between Netherlands and Hungary (+7). We thus re-ran our model without this game (refer Table 3). These results are now more consistent with our expectations. Consequently, we applied this revised model to predict Scotland's potential outcomes in the 2016 UEFA Euro qualifiers.

Table 3: Results without Netherlands-Hungary.

Variable	Coefficient	p-value
Population	2.5462	0.0003
GDP per capita	-1.3717	0.0818
Climate	-0.0004	0.3915
Experience	2.4032	0.0069
Percentage of players	6.7136	0.0060
Player quality	0.0292	0.0297
Foreign managers	0.1786	0.3189
Technology transfer	0.0169	0.9225
Home advantage	0.6747	0.0366
Prize	0.3513	0.0245
Prize difference / favourite team	0.8088	0.0032
Prize difference / underdog	-0.1098	0.8947
No prize	0.0694	0.6213
Constant	-0.4998	0.1059
Observations	367	
Adjusted R^2	0.476	

V Scotland's potential progress in the UEFA Euro 2016 qualifiers

Model 1

Table 4 provides the outcomes in the UEFA Euro 2016 qualifying Group D according to our model. First, the differences between teams in each individual game are given, resulting from the application of coefficients outlined in Table 3 to each game. The coefficient for home advantage is 0.6747, which should mean for example that if Scotland loses by two goals against Germany in Germany, it should theoretically lose by less than one goal at home (2 - 0.6747 - 0.6747 = 0.6506: Germany loses its home advantage (-0.6747) and has even now an away disadvantage (-0.6747 again)). Actually, we considered that the constant in our model (-0.4998) counterbalances the strength of home advantage and reduces it to 0.1749 (0.6747 - 0.4998). Of our 367 observations, 351 took place at a national stadium while 16 took place at a neutral ground. Hence that is why we apply 0.1749 for home advantage. Second, below Table 4 we provide the standing resulting from the differences between teams in each individual game, based on the UEFA rules for the allocation of points at the end of each game (i.e. 3 points for a win, 1 point for a draw, 0 point for a loss) and deciding between teams with the same number of points (i.e. goal difference in all games – as noted in brackets).

Table 4: Outcomes in the UEFA Euro 2016 qualifying Group D according to our model

	Germany	Ireland	Poland	Scotland	Georgia	Gibraltar
Germany		+2	+2	+2	+2	+6
Ireland	-1		0	0	+1	+4
Poland	-1	+1		+1	+1	+5
Scotland	-2	0	0		+1	+4
Georgia	-2	0	-1	0		+4
Gibraltar	-6	-4	-4	-4	-4	

1. Germany 30
2. Poland 20
3. Ireland 13 (+5)
4. Scotland 13 (+4)
5. Georgia 8
6. Gibraltar 0

Scotland should be in contention with Ireland in Group D to take part in the playoffs for the UEFA Euro 2016 Finals, but fail to do so by one goal. Germany – the current World Champions – should win all its matches, taking advantage of its population, experience, percentage of players and its player quality (Table 5). Poland should take advantage of its population and lower GDP per capita compared to Germany, Ireland and Scotland. The latter two countries have very similar data, with Scotland having better experience and Ireland a larger percentage of players.

Table 5: Data in the UEFA Euro 2016 qualifying Group D

	Population	GDP per capita	Temperature	Experience	Percentage of players	Player quality	Foreign manager	Technology transfer
Germany	80 640 000	40369.97	8.50	887	20.22%	10	0	0
Ireland	4 662 000	40267.27	9.11	505	9.04%	0	0	0
Poland	38 548 000	21679.39	7.87	756	5.19%	1	0	0
Scotland	5 300 000	44339.62	8.31	726	7.94%	0	0	0
Georgia	4 489 000	6007.129	7.36	516	4.95%	0	0	1
Gibraltar	29 259	34177.52	18.60	52	7.00%	0	0	0

Model 2

It seems proper that we should compare real score and the score provided by the model based on the period August 2012 to December 2013 for every men's international football team (except Gibraltar that did not play) to assess potential over or under-performance (refer to Appendices 1 to 5). We took this into account to correct our model. According to our new model, Scotland should be in contention with Poland to take part in the playoffs for the qualification in the UEFA Euro 2016, but still fail to do so by one goal (Table 6). However, an encouraging point to note is that Scotland has performed strongly since June 2013, after having underperformed up until March 2013 (Appendix 1). This could mean that Scotland could outperform Poland.

Table 6: Outcomes in the UEFA Euro 2016 qualifying Group D according to our corrected model

	Germany	Ireland	Poland	Scotland	Georgia	Gibraltar
Germany		+2	+2	+2	**+3**	+6
Ireland	-1		**+1**	**+1**	**+2**	**+5**
Poland	**-2**	**0**		**0**	+1	+5
Scotland	-2	0	0		+1	+4
Georgia	**-3**	**-1**	-1	**-1**		**+3**
Gibraltar	-6	-4	-4	-4	**-3**	

1. Germany 30
2. Ireland 20
3. Poland 15 (+6)
4. Scotland 15 (+5)
5. Georgia 6
6. Gibraltar 0

Model 3

We then replaced our previous model by using a regression in which we explain score difference by way of home advantage and dummies for every team instead of by the previously used determinants. For example, for Scotland, we use 1 when it played at home and -1 when it played away; we use the same principle for other teams. The advantage of this approach is that it directly captures team strengths over the period August 2012 to December 2013. Given that Gibraltar did not play over this period, we arbitrarily chose to allocate San Marino's coefficient to Gibraltar. Using this updated model – which is the most powerful for predictions (adjusted R^2 = 0.527) – Scotland should come third in Group D and qualify for the playoffs (Table 7). The best third team among all groups will be directly qualified for the UEFA Euro 2016 but our model predicts that it will not be Scotland; rather it predicts it will be Sweden. The other teams it predicts that will take part in the playoffs will be: Iceland, Israel, Slovakia, Slovenia, Romania, Bulgaria and Denmark. According to our coefficients, the hierarchy among Scotland and these teams is as follows: Israel (5.647), Slovakia (5.550), Romania (5.499), Scotland (5.494), Slovenia (5.341), Bulgaria (5.272), Iceland (5.148) and Denmark (5.100). In taking into account home advantage (+0.281), this would mean that Scotland should qualify against Bulgaria, Iceland and Denmark (+1 at home, 0 away) whereas other confrontations should be very uncertain (0 at home, 0 away). Using this model based on team strengths over the period August 2012 to December 2013, the standings in the different groups for the UEFA Euro 2016 qualifiers should be as set out in Table 8. For each team we indicate its coefficient in our model and not its number of points; but the ranking is the same using either approach.

Table 7: Outcomes in the UEFA Euro 2016 qualifying Group D according to home advantage and team strengths over the period August 2012 to December 2013

	Germany	Ireland	Poland	Scotland	Georgia	Gibraltar
Germany		+2	**+3**	**+3**	+3	**+8**
Ireland	-2		+1	+1	+1	**+6**
Poland	-2	**-1**		0	+1	+5
Scotland	-2	0	**+1**		+1	**+5**
Georgia	**-3**	-1	**0**	**0**		**+5**
Gibraltar	**-7**	**-5**	-4	**-5**	**-3**	

1. Germany 30
2. Ireland 22
3. Scotland 15
4. Poland 11
5. Georgia 8
6. Gibraltar 0

Table 8: Standings in the UEFA Euro 2016 qualifiers according to team strengths over the period August 2012 to December 2013

A	**1. Netherlands (7.036), 2. Czech Republic (5.661), *3. Iceland (5.148)***, 4. Turkey (5.138), 5. Kazakhstan (4.606), 6. Latvia (4.403)
B	**1. Bosnia and Herzegovina (7.385), 2. Belgium (6.887), *3. Israel (5.647)***, 4. Wales (5.129), 5. Cyprus (4.137), 6. Andorra (2.535)
C	**1. Spain (7.140), 2. Ukraine (6.558), *3. Slovakia (5.550)***, 4. Belarus (5.333), 5. Macedonia (5.148), 6. Luxembourg (3.910)
D	**1. Germany (7.776), 2. Ireland (5.935), *3. Scotland (5.494)***, 4. Poland (5.083), 5. Georgia (4.950), 6. Gibraltar (0.408)
E	**1. England (6.574), 2. Switzerland (6.245), *3. Slovenia (5.341)***, 4. Lithuania (4.753), 5. Estonia (4.142), 6. San Marino (0.408)
F	**1. Greece (6.244), 2. Finland (5.914), *3. Romania (5.499)***, 4. Hungary (4.901), 5. Northern Ireland (4.679), 6. Faroe Islands (3.607)
G	**1. Russia (6.653), 2. Austria (6.266), 3. Sweden (6.191)**, 4. Montenegro (5.755), 5. Moldova (3.745), 6. Liechtenstein (3.344)
H	**1. Italy (5.949), 2. Croatia (5.831), *3. Bulgaria (5.272)***, 4. Norway (5.027), 5. Azerbaijan (4.961), 6. Malta (3.201)
I	**1. Portugal (6.470), 2. Serbia (6.355), *3. Denmark (5.100)***, 4. Albania (4.999), 5. Armenia (4.760)

Model 4

A fourth and final approach attempts to predict Scotland's progress in the UEFA Euro 2016 qualifiers by thinking in terms of cycles and observing the performance of countries in Group D over 2011, 2012 and 2013 (Table 9). Ireland and Scotland are quite similar: good performances in 2011, not so good in 2012 and better in 2013. By contrast, Poland's performance was poor in 2013. The best situation for Scotland would be for it to continue its improvement evident over 2012 and 2013. In 2013, Scotland came close to Ireland (difference of 0.123) with a stronger increase (+1.399 vs. +1.050). It is difficult to anticipate whether countries will perform in the same way. However, it seems possible that Scotland could become as good as Ireland and perhaps even slightly better. Consequently, it is possible that Scotland could secure second place in Group D and gain direct qualification to the UEFA Euro 2016 Finals.

Table 9: Performance of countries in the UEFA Euro 2016 qualifying Group D in 2011, 2012 and 2013

	2011	European rank	2012	European rank	2013	European rank
Germany	7.275	3	6.954	5	7.757	1
Ireland	6.611	9	4.974	36	6.024	15
Poland	5.871	19	6.069	17	4.926	36
Scotland	6.288	12	4.502	39	5.901	17
Georgia	5.236	29	5.013	34	4.577	41

VI Limitations of the model

The above results improve our knowledge about the determinants of national men's football team performance by taking on board some new explanatory variables. However, some limitations must be underlined. For example, we define Player quality as the number of players who play in the 10 most valuable clubs and who have been fielded at least in 20 games per season. Using this definition, Atletico Madrid, which has reached the Champions League final in 2013-2014, is not among the most valuable clubs. In 2012-2013, Borussia Dortmund, which also reached the Champions League final, was not listed in the 10 most valuable clubs either. These teams performed well due to their team spirit and coach influence, as much as to their player quality. Hence, sampling the most valuable clubs can be improved and besides, money does not always guarantee both victories on the pitch or appropriate player recruitment. For example, Liverpool, which has appeared each year in the Top 10 most valuable clubs, did not achieve to qualify in the Champions League four years in a row (from 2009/2010 to 2012/2013). This raises the question whether Liverpool players really were among the best in the world.

In this paper, we have chosen to follow Kuper and Szymanski (2012) in confining the importance of Foreign Managers and Technology Transfer dummies to Belgium, France, Germany, Italy and Netherlands. However, this can be criticised. Choosing these dummies implies accepting Kuper and Szymanski's underlying implicit hypotheses. For instance, if a manager has been transferred from one of the five core countries, he is automatically considered to be a good manager - even if he has never played at a professional level. Also, if a manager originates from a country other than the core and has never played in one of the five core countries or been trained by a manager from these countries, he is automatically considered as not being a good manager. This would mean that Gordon Strachan (Scotland manager) is not considered a good manager, which seems highly questionable considering Scotland's performance since June 2013. Similarly, it would also mean that Alex Ferguson could not be considered a good manager, whereas he is regarded as one of the most successful managers in the history of the game (Hoye, Smith, Nicholson, Stewart & Westerbeek, 2008). It is worth noting that Alex Ferguson trained Gordon Strachan from 1978 to 1984 at Aberdeen and from 1986 to 1989 at Manchester United. Despite their rivalry (Austin, 2006), it is possible that Gordon Strachan takes advantage from skill transfer from Alex Ferguson. A finer identification of the most successful managers and the test of skill transfer from these managers could be improved in our model.

As noted above, our “predictions” are mainly based on outcomes of the results of European men’s international football matches over the period August 2012 to December 2013. Nevertheless, there is no reason to expect that national team strengths over the period August 2014 to December 2015 will be the same that over the same period 2012 to 2013. Table 10 provides European national team strengths over the periods January 2011 to July 2012 and August 2012 to December 2013. It can be seen clearly that the hierarchy of European national teams has largely evolved between the two periods. For this reason, it is necessary to be careful about our “predictions”.

Table 10: European men’s national football team strengths and rankings over the periods January 2011 to July 2012 and August 2012 to December 2013

	01/2011-07/2012	Rank	08/2012-12/2013	Rank	Rank difference
Albania	4.419	42	4.999	36	+6
Andorra	3.183	52	2.535	52	0
Armenia	5.647	25	4.760	40	-15
Austria	5.230	29	6.266	12	+17
Azerbaijan	4.119	45	4.961	37	+8
Belarus	4.692	38	5.333	27	+11
Belgium	5.985	16	6.887	6	+10
Bosnia and Herzegovina	5.692	23	7.385	2	+21
Bulgaria	4.955	35	5.272	28	+7
Croatia	6.391	11	5.831	19	-8
Cyprus	4.100	46	4.137	46	0
Czech Republic	6.086	13	5.661	21	-8
Denmark	6.465	10	5.100	33	-23
England	6.917	4	6.574	8	-4
Estonia	4.094	47	4.142	45	+2
Faroe Islands	3.473	50	3.607	49	+1
Finland	5.191	32	5.914	18	+14
France	6.500	9	6.976	5	+4
Georgia	5.207	31	4.950	38	-7
Germany	7.007	2	7.776	1	+1
Greece	6.002	15	6.244	14	+1
Hungary	5.906	19	4.901	39	-20
Iceland	4.720	37	5.148	29	+8
Ireland	6.114	12	5.935	17	-5
Israel	5.208	30	5.647	22	+8
Italy	6.505	8	5.949	16	-8
Kazakhstan	4.277	44	4.606	43	+1
Latvia	5.130	33	4.403	44	-11
Liechtenstein	3.896	48	3.344	50	-2
Lithuania	4.428	41	4.753	41	0
Luxembourg	3.703	49	3.910	47	+2
Macedonia	4.690	39	5.148	30	+9
Malta	4.451	40	3.209	51	-11
Moldova	4.375	43	3.745	48	-5
Montenegro	5.038	34	5.755	20	+14
Netherlands	6.854	5	7.036	4	+1

Northern Ireland	3.411	51	4.679	42	+9
Norway	5.652	24	5.027	35	-11
Poland	5.770	20	5.083	34	-14
Portugal	6.715	6	6.470	10	-4
Romania	5.693	22	5.499	24	-2
Russia	6.977	3	6.653	7	-4
San Marino	1.581	53	0.408	53	0
Scotland	6.019	14	5.494	25	-11
Serbia	5.576	26	6.355	11	+15
Slovakia	4.942	36	5.550	23	+13
Slovenia	5.258	28	5.341	26	+2
Spain	7.750	1	7.140	3	-2
Sweden	6.600	7	6.191	15	-8
Switzerland	5.967	18	6.245	13	+5
Turkey	5.977	17	5.138	31	-14
Ukraine	5.510	27	6.558	9	+18
Wales	5.723	21	5.129	32	-11

VII Conclusion

In this paper, we propose a score equation based on 13 variables which we apply to assess Scotland's likely progress in the UEFA Euro 2016 qualifiers. In our first two models, Scotland fails to progress to the UEFA Euro 2016 playoffs by only one goal. Nevertheless, in our third model which is better, it predicts that Scotland should be third in Group D and thus progress to the playoffs and thus hope to qualify for Euro 2016 Finals. Using our fourth model – and assuming a continuing improvement in Scotland's performance – allows us to posit that Scotland could even come second to Germany in Group D and thus allow Scotland to qualify directly to the UEFA Euro 2016 Finals in France. Bonne chance, l'Écosse!

References

Allan, G.J., & Moffat, J. (2014). Muscle drain versus brain gain in association football: Technology transfer through player emigration and manager immigration. *Applied Economics Letters, 21*, 490-493.

Andreff, W., & Andreff, M. (in press). Economic prediction of sport performances from Beijing olympics to 2010 FIFA world cup in South Africa: The notion of surprising sporting outcome. In P. Rodriguez, S. Késenne and R. Koning (Eds.), *The economics of competitive sport*. Cheltenham, UK: Edward Elgar.

Austin, S. (2006, 12 September). *Fergie v Strachan.* BBC. Available at: http://news.bbc.co.uk/sport1/hi/football/europe/5335578.stm

Baur, D.G., & Lehmann, S. (2007). Does the mobility of football players influence the success of the national team? IIIS Discussion Paper No. 217, Institute for International Integration Studies, Dublin.

Berlinschi, R., Schokkaert, J., & Swinnen, J. (2013). When drains and gains coincide: Migration and international football performance. *Labour Economics, 21*, 1-14.

Forbes (2013). Soccer's most valuable teams. Retrieved February 26, 2014, from http://www.forbes.com/soccer-valuations/

Gelade, G.A., & Dobson, P. (2007). Predicting the comparative strengths of national football teams. *Social Science Quarterly, 88*, 244-258.

Hoffmann, R., Lee, C.G., & Ramasamy, B. (2002). The socioeconomic determinants of international soccer performance. *Journal of Applied Economics, 5*, 253-272.

Hoffmann, R., Lee, C.G., Matheson, V., & Ramasamy, B. (2006). International women's football and gender inequality. *Applied Economics Letters, 13*, 999-1001.

Houston, R.G., & Wilson, D.P. (2002). Income, leisure and proficiency: An economic study of football performance. *Applied Economics Letters, 9*, 939-943.

Hoye, R., Smith, A., Nicholson, M., Stewart, B., & Westerbeek, H. (2008). *Sport Management: Principles and Applications.* Abingdon, UK: Routledge.

Kuper, S., & Szymanski, S. (2012). *Soccernomics*. London: HarperSport.

Leeds, M.A., & Leeds, E.M. (2009). International soccer success and national institutions. *Journal of Sports Economics, 10*, 369-390.

Macmillan, P., & Smith, I. (2007). Explaining international soccer rankings. *Journal of Sports Economics, 8*, 202-213.

Yamamura, E. (2009). Technology transfer and convergence of performance: An economic study of FIFA football ranking. *Applied Economics Letters, 16*, 261-266.

Yamamura, E. (2012). Effect of linguistic heterogeneity on technology transfer: An economic study of FIFA football rankings. *Atlantic Economic Journal, 40*, 85-99.

Appendices

Appendix 1: Comparison between real score and score provided by the model for Scotland over the period 08/2012-12/2013.

Date	Match	Real score	Score provided by the model
08/09/2012	Scotland-Serbia	0	0
11/09/2012	Scotland-Macedonia	0	+1
12/10/2012	Wales-Scotland	+1	0
16/10/2012	Belgium-Scotland	+2	+1
14/11/2012	Luxembourg-Scotland	-1	-1
06/02/2013	Scotland-Estonia	+1	+1
22/03/2013	Scotland-Wales	-1	+1
26/03/2013	Serbia-Scotland	+2	+1
Total Scotland till 03/2013		***-4***	***+2***
07/06/2013	Croatia-Scotland	-1	+1
14/08/2013	England-Scotland	+1	+2
06/09/2013	Scotland-Belgium	-2	-1
10/09/2013	Macedonia-Scotland	-1	0
15/10/2013	Scotland-Croatia	+2	-1
19/11/2013	Norway-Scotland	-1	0
Total Scotland since 06/2013		***+2***	***-5***
Total Scotland		**-2**	**-3**
Average gap		**+0.071**	

Appendix 2: Comparison between real score and score provided by the model for Germany over the period 08/2012-12/2013.

Date	Match	Real score	Score provided by the model
07/09/2012	Germany-Faroe Islands	+3	+4
11/09/2012	Austria-Germany	-1	-1
12/10/2012	Ireland-Germany	-5	-2
16/10/2012	Germany-Sweden	0	+2
14/11/2012	Netherlands-Germany	0	-1
06/02/2013	France-Germany	-1	0
22/03/2013	Kazakhstan-Germany	-3	-2
26/03/2013	Germany-Kazakhstan	+3	+3
06/09/2013	Germany-Austria	+3	+2
10/09/2013	Faroe Islands-Germany	-3	-4
11/10/2013	Germany-Ireland	+3	+3
15/10/2013	Sweden-Germany	-2	-1
15/11/2013	Italy-Germany	0	0
19/11/2013	England-Germany	-1	0
Total Germany		**+28**	**+25**
Average gap		**+0.214**	

Appendix 3: Comparison between real score and score provided by the model for Ireland over the period 08/2012-12/2013.

Date	Match	Real score	Score provided by the model
15/08/2012	Serbia-Ireland	0	0
07/09/2012	Kazakhstan-Ireland	-1	-1
12/10/2012	Ireland-Germany	-5	-2
16/10/2012	Faroe Islands-Ireland	-3	-2
14/11/2012	Ireland-Greece	-1	0
06/02/2013	Ireland-Poland	+2	0
22/03/2013	Sweden-Ireland	0	+1
26/03/2013	Ireland-Austria	0	0
29/05/2013	England-Ireland	0	+2
02/06/2013	Ireland-Georgia	4	0
07/06/2013	Ireland-Faroe Islands	+3	+2
11/06/2013	Spain-Ireland	+2	+1
14/08/2013	Wales-Ireland	0	0
06/09/2013	Ireland-Sweden	-1	0
10/09/2013	Austria-Ireland	+1	+1
11/10/2013	Germany-Ireland	+3	+3
15/10/2013	Ireland-Kazakhstan	+2	+1
15/11/2013	Ireland-Latvia	+3	+1
19/11/2013	Poland-Ireland	0	+1
	Total Ireland	**+5**	**-4**
	Average gap	**+0.474**	

Appendix 4: Comparison between real score and score provided by the model for Poland over the period 08/2012-12/2013.

Date	Match	Real score	Score provided by the model
15/08/2012	Estonia-Poland	+1	-1
11/09/2012	Poland-Moldova	+2	+2
17/10/2012	Poland-England	0	-1
14/12/2012	Poland-Macedonia	+3	0
06/02/2013	Ireland-Poland	+2	0
22/03/2013	Poland-Ukraine	-2	0
26/03/2013	Poland-San Marino	+5	+4
04/06/2013	Poland-Liechtenstein	+2	+4
07/06/2013	Moldova-Poland	0	-1
14/08/2013	Poland-Denmark	+1	0
10/09/2013	San Marino-Poland	-4	-4
11/10/2013	Ukraine-Poland	+1	+1
15/10/2013	England-Poland	+2	+2
15/11/2013	Poland-Slovakia	-2	0
19/11/2013	Poland-Ireland	0	+1
	Total Poland	**+7**	**+13**
	Average gap	**-0.4**	

Appendix 5: Comparison between real score and score provided by the model for Georgia over the period 08/2012-12/2013.

Date	Match	Real score	Score provided by the model
15/08/2012	Luxembourg-Georgia	-1	-1
07/09/2012	Georgia-Belarus	+1	0
11/09/2012	Georgia-Spain	-1	-1
12/10/2012	Finland-Georgia	0	0
16/10/2012	Belarus-Georgia	+2	+1
22/03/2013	France-Georgia	+2	+1
02/06/2013	Ireland-Georgia	+4	0
05/06/2013	Denmark-Georgia	+1	+1
14/08/2013	Kazakhstan-Georgia	+1	-1
06/09/2013	Georgia-France	0	-1
10/09/2013	Georgia-Finland	-1	0
15/10/2013	Spain-Georgia	+2	+2
	Total Georgia	**-12**	**-5**
	Average gap	**-0.582**	

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