When Drains and Gains Coincide:

Migration and International Football Performance

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Abstract

We examine the impact of football player migration to foreign leagues on their origin countries' international football performance. In our model, players acquire superior skills in foreign clubs, but continue to represent their origin country's national team, so emigration improves international football performance. To test this prediction, we have collected information on the club of employment of national team players for most countries in the world. We have constructed an original migration index, weighting each emigrant player by the quality of his club of employment. We find strong and robust support for the theoretical prediction that migration of players to foreign leagues improves their origin countries' international football performance.

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1. Introduction

It is well known today that international migration affects the level of human capital in origin countries in both positive and negative ways. In the short term, migration of skilled workers leads to a direct loss of human capital for the origin countries of migrants. In the long term, migration may induce human capital gains through several channels. The possibility of migration increases individual incentives to invest in human capital. Migrants' remittances may allow more families to afford such investments. Some migrants return to their origin countries after a while, with new skills acquired abroad. Depending on the circumstances, the net impact of skilled emigration on human capital may be either negative or positive, what is sometimes referred to as "brain drain" or "brain gain".[1]

A very interesting sector to study these effects is sports, where international migration is a particularly important phenomenon. The share of migrants in the main sports leagues in Europe and North America is very large compared to average economic sector standards, in particular for the top leagues. In some cases, European first division teams employed 100% migrant players. In contrast to the nuanced view of impact of the brain drain on sending countries expressed in the recent migration literature, the sports literature has typically been dominated by the negative view that "muscle drain" undermines the sporting capacity of developing countries[2].

In this paper we focus on football (soccer) player migration, which has grown exponentially over the past decade. Migration of football players accelerated with the 1995 Bosman ruling, which removed restrictions on the number of players originating from European countries that could be recruited by European clubs, and which was extended to other origin

[1] See e.g. Adams (2003), Stark (2004), Özden and Schiff (2005), Boucher et al. (2005), Beine et al. (2008).
[2] See e.g. Swinnen and Vandemoortele (2009) for a review.

countries (and sports) by the Malaja, Kolpak and Simutenkov cases and the 2000 Cotonou agreement.[3] Similarly to the familiar brain drain concerns, the globalization of the market for football players has been accused of causing a "muscle drain" for developing countries, depriving them of their most talented players for the benefit of professional leagues in rich countries.[4]

Interestingly, a particularity of football player migration differentiates muscle drain from brain drain. Unlike most skilled migrants, who can only work in one country at a time, football players can play for their home country national team, while being hired by foreign country clubs. Thus, not only are national teams not deprived of their talents, but they may actually benefit from the additional skills acquired by their players training in top European leagues.

Some analysts pointed out the concern that European clubs do not always allow their foreign players to participate in international competitions, like the Africa Cup of nations for example, which erodes the capacity of the home country to use its most talented athletes in international competition, leading to poor performances of developing countries in world sport events (Andreff, 2004, 2009). However, ad hoc observations suggest that developing countries have done better, not worse, since the start of substantial migration of their football players to rich country competitions. African teams have performed increasingly well in World Cups in the past decades. Despite the fact that many Ghanaian players are employed by European clubs, Ghana managed to reach the quarter final in the 2010 World Cup. This is an important achievement for an African country, with only two precedents: Cameroon in 1990 and Senegal in

[3] The Malaja, Kolpak and Simutenkov cases extend the Bosman jurisprudence to different sports and to citizens of Central Eastern European and CIS countries (Andreff, 2006). The 2000 Cotonou agreement, signed by the European Union and 77 African, Caribbean and Pacific countries, allows athlete transfers from the latter area under the qualification of assimilated Europeans (Chaix, 2004). For discussions on the implications of the Bosman ruling, see e.g. Simmons (1997), Szymanski (1999), Antonioni and Cubbin (2000), Ericson (2000), Feess and Muelheusser (2003), Penn (2006), Binder and Findlay (2009), Frick (2009).

[4] See e.g. Gerrard (2002), Magee and Sugden (2002), Andreff (2004, 2009), Poli (2006, 2008), Darby (2007a, 2007b), Darby et al. (2007).

2002. This paper goes beyond anecdotal evidence by providing rigorous econometric tests of the impact of football player migration on the performance of sending countries' national teams. It contributes to two recent fields of the economics literature: the migration literature that analyses empirically the impact of skilled migration on the level of human capital in sending countries and the sports economics literature that analyses the determinants of international football performance.

Recent datasets on migration rates by skill levels have allowed empirical analyzes of the impact of skilled migration on human capital in sending countries. Some papers focused on the positive incentive effect that the possibility of migration may have on human capital accumulation in sending countries (Beine et al., 2007, Beine et al., 2008 and Beine et al., 2009). Other papers analyzed skilled migrants' remittances, which may help overcome liquidity constraints for investing in human capital (Faini, 2007, and Niimi et al., 2008). The potentially positive impact of human capital acquired abroad and brought back in sending countries by temporary/return migrants is one of less well documented areas in this literature. Most existing studies attempt to provide estimates of the return rates of skilled migrants (for a review, see Docquier and Rapoport, 2010). The impact of the returnees' additional human capital is generally difficult to quantify. One particular sector in which such an econometric exercise is feasible is the migration of highly qualified sportsmen to foreign leagues. Institutional constraints specific to the sports sector (one needs to be a citizen in order to represent a country's national team) and data availability (the clubs of employment of players can be easily found on the internet) allow us to analyze the impact of migrants' skills acquired in foreign leagues on the international football performance of their origin country.

Empirical studies in sports economics have shown that international football performance is determined by economic, demographic, cultural, historical and climatic factors (Hoffmann et al., 2002; Houston and Wilson, 2002; Torgler, 2006; MacMillan and Smith, 2007). More recent empirical contributions have found new explanatory factors, such as linguistic heterogeneity (Yamamura, 2008), national institutions (Leeds and Leeds, 2009) and the level of health expenditures as a percentage of national income (Luiz and Fadal, 2010). To the best of our knowledge, five academic papers have analyzed, directly or indirectly, the effects of football players' migration to foreign leagues on national team performance.

Milanovic (2005) is the first to consider this question. He focuses on the impact of player migration on inequality between teams, rather than on team performance. He develops a theoretical model predicting that the opening of football markets reduces inequality between national teams due to skills spillover between players. He provides descriptive statistics from the history of the World Cup suggesting that inequality between national teams, as measured by the average goal difference between winners and losers, gradually decreased between 1950 and 2002. This innovative paper has two potential weaknesses: the theoretical model is based on some very specific assumptions on the distribution of skills between countries and no econometric analysis is provided. Gelade and Dobson (2007) are the first to provide an econometric analysis of the impact of migration on national team performance. They estimate the effect of an expatriate index, measured by the percentage of players training abroad, on the comparative strength of national football teams. While controlling for the size of the talent pool, football culture, economic resources and the climate, they find a positive and highly significant coefficient for their expatriate index. However, their results may be biased by an endogeneity problem. The authors proxy the talent pool by a logarithmic measure of the total number of regular football players in the country. This variable is prone to reverse causality, since the performance of the national team may influence the popularity of the game, and therefore the number of regular players. Baur and Lehmann (2007) regress FIFA rankings on the number of imported and exported players. They find that national teams with a higher percentage of players under contract abroad perform better. However, the sample that is used for their study is rather limited: players are only considered imports or exports if they were in a national team that qualified for the 2006 World Cup in Germany. Moreover, the measures used for the market values of players have been criticized by Frick (2009). Using data on the participation of semifinals or finals in the World Cup and the European Championship from 1978 until 2006, Frick (2009) finds that the migration of players to the financially rewarding leagues in Western Europe does not improve national team performance. Another recent paper by Yamamura (2009) provides empirical evidence on the existence of football technology spillovers from developed to developing countries. The author considers the average world ranking points for the best leagues, i.e. Italy, England, Germany and Spain as a proxy for the most advanced technology level and finds that technology transfers have a positive impact on the performance of developing countries' national teams. However, this paper does not consider directly the role of migration in technology spillovers. Finally, none of these empirical studies draws upon an explicit theoretical framework.

We analyze the impact of football players' migration on national team performance by addressing some of the shortcomings of previous studies. Contrarily to Milanovic (2005), we make no specific assumption on the distribution of players' skills among countries. Second, we test empirically the main prediction of the model, i.e. the existence of a positive but decreasing effect of migration on national team performance due to superior training acquired by migrating players in foreign clubs. Third, in order to quantify the skills spillover effect of migrating players, we construct a weighted migration index that takes into account the strength of the foreign clubs to which players migrated. Our index is a more accurate measure of skill acquisitions through migrations than the percentage of migrant players used by Gelade and Dobson (2007) and Frick (2009), since the quality of training varies considerably among clubs and leagues. Fourth, we use population size instead of the number of regular players as a proxy for the talent pool, in order to overcome reverse causality. Fifth, we use a much larger sample than Baur and Lehmann (2007) by including migrating players from all national teams.

Contrarily to Yamamura (2009), we explicitly analyze the effect of the migration channel on technology spillovers. Finally, we provide a theoretical framework in which the performance of the national team is explicitly computed as a function of players' migration rate.

Our theoretical framework assumes that there are two countries in the world, one of which has bigger football markets. Players can choose between training in a home club and training in a foreign club. Migration to a foreign club entails a cost, but it increases player's productivity and revenue if training is superior in the foreign club. We show that only the most talented players will migrate if the revenue gain from immigration is proportional to innate talent. We compute the migration rate of players in the national team and we show that performance is an increasing and concave function of the migration rate.

We test these predictions using cross country data on national team performance and the club of employment of national squad players. In line with the theoretical predictions, we find that our weighted migration index has a positive and significant impact on the performance of national squads. This result is very robust across different specifications. We also find evidence for a diminishing impact of migrations as predicted by the theoretical model, although this result is less robust.

The rest of the paper is organized as follows. Section 2 provides the theoretical framework. Section 3 presents the empirical specification, the data and the results. Section 4 concludes.

2. Theoretical Framework

Assume there are two countries in the world: home and foreign. Each country has a national football team with N players. Player $i,\ i = 1,..,N$ in the home national team has an innate talent t_i, and player $i,\ i = 1,..,N$ in the foreign national team has an innate talent ${t_i}^*$. Players are ranked by increasing talent, such that $t_1 < t_2 < \cdots < t_N$ and ${t_1}^* < {t_2}^* < \cdots < {t_N}^*$. Let $t = \sum_{i=1}^{N} t_i$ be the total stock of talent of the home national team and $t^* = \sum_{i=1}^{N} {t_i}^*$ be the total stock of talent of the foreign national team.

The talent of each player and the training that he gets in the club he is playing for determine his skills for football. We assume that the skills s_i of player i are given by the function:

$$s_i = k_i t_i, \tag{1}$$

where k_i is the training level of player i.

Players can choose to play for a foreign club, but they cannot play for the foreign national team.

Without loss of generality, we assume that the market for football is bigger in the foreign country. Having access to bigger markets, foreign clubs earn higher revenues from each game and thus have more resources to invest in infrastructure, coaches, medical care and other training facilities.[5] Foreign country clubs therefore offer better training than home country clubs.

For simplicity, we assume that players get a training level k if they play in a home country club and $k^* > k$ if they play in a foreign country club.[6]

Players' wages are an increasing function of their skills. We assume that a player with skills s_i earns γs_i, with $\gamma > 0$. Players from the home national team earn more if they play for a foreign club, since $\gamma k t_i < \gamma k^* t_i$.

In line with the international migrations literature, we suppose that migrating abroad entails a cost c for the players (Borjas, 1989). This cost includes moving expenditures, but also emotional and social costs of leaving one's home country, learning a new language, adapting to a new culture, etc.

Player i will therefore migrate if

$$\gamma k t_i < \gamma k^* t_i - c, \tag{2}$$

which is equivalent to

$$t_i > t_{\bar{\imath}} \equiv c/\gamma(k^* - k). \tag{3}$$

A player with a talent level equal to $t_{\bar{\imath}}$ is exactly indifferent between playing for a home club and migrating to a foreign club. Players with higher talent migrate to a foreign club and players with lower talent play for domestic clubs. [7]

Condition (3) implies that the minimum talent level inducing emigration increases with the migration cost and decreases with the difference in the quality of training between foreign

[5] This assumption could be endogenized by solving the optimization problem of a club willing to maximize winning probability subject to the balanced budget constraint.

[6] In reality, the quality of clubs in a country is obviously not homogenous. The parameters k and k^* can be interpreted as an average of the training level in home and foreign country clubs respectively.

[7] The value of $\bar{\imath}$ is defined as follows: $\bar{\imath} = 0$ if $t_{\bar{\imath}} < t_1$, $\bar{\imath} = N$ if $t_{\bar{\imath}} > t_N$ and $\bar{\imath} = i$ if $t_i \leq t_{\bar{\imath}} < t_{i+1}$ for $i = 1..N$.

and home clubs. It also implies that no foreign player is willing to work for a home club since that would imply bearing the migration cost and earning lower revenues.

We can then define the football migration rate m as the share of national talent playing for a foreign club:

$$m \equiv \sum_{i=\bar{\imath}+1}^{N} t_i / \sum_{i=1}^{N} t_i. \tag{4}$$

We can now relate the performance of the national team to migration. The performance of a team is given by its winning percentage. We follow Kesenne (2007) and define the winning percentage of a team by the following logit contest success function:

$$p = s/(s + s^*), \tag{5}$$

where p is the probability that the home team wins a game against the foreign team, $s = \sum_{i=1}^{N} s_i$ is the stock of skills of the home national team and $s^* = \sum_{i=1}^{N} s_i{}^*$ is the stock of skills of the foreign national team.

As all players $i > \bar{\imath}$ from the home national team migrate to a foreign club, where they get a training equal to k^*, the winning percentage of the national team will be equal to:

$$p = (k \sum_{i=1}^{\bar{\imath}} t_i + k^* \sum_{i=\bar{\imath}+1}^{N} t_i)/(k \sum_{i=1}^{\bar{\imath}} t_i + k^* \sum_{i=\bar{\imath}+1}^{N} t_i + k^* \sum_{i=1}^{N} t_i{}^*). \tag{6}$$

We can express this winning percentage as a function of the football migration rate:

$$p = [tm(k^* - k) + kt]/[tm(k^* - k) + kt + k^*t^*]. \tag{7}$$

Deriving p with respect to m gives:

$$\partial p/\partial m = t(k^* - k)k^*t^*/(tm(k^* - k) + kt + k^*t^*)^2 > 0. \tag{8}$$

It follows from (8) that migration has a positive effect on national team performance.

This positive effect depends on the assumption that migrating players obtain superior training ($k^* > k$). This is a reasonable assumption, if one admits that players' wages are proportional to their skills and that migration is costly. Indeed, no player would be willing to bear the migration cost if foreign club wages were inferior to domestic club wages.

We can check that performance is a concave function of the migration rate:

$$\partial^2 p/\partial m^2 = -2t^2(k^* - k)^2 k^* t^* / (tm(k^* - k) + kt + k^* t^*)^3 < 0. \quad (9)$$

Concavity is due to the shape of the contest success function (5). Different signs for the second order derivative could be obtained with a more general contest success function.[8]

Our theoretical model predicts that football players' migration rate to foreign clubs has a positive but diminishing influence on the performance of their home national teams. The following section provides empirical evidence supporting this argument.

3. Empirical Framework

We test the predictions of the model using cross country data on FIFA countries' national team performance and the club of employment of their players. The following sections provide the definitions of the variables used, the data sources, the estimation techniques, the regression results and some extensions and robustness checks.

3.1. Variables and Data

Following the football economics literature, we measure national team performance by the number of FIFA points each national team has obtained during games played against other national teams. The number of points per game depend on the outcome of the game, on the importance of the game, on the strength of the opponent and on the strength of the regional confederation. The performance of a team is computed as the sum of current year performance

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[8] For example, the contest success function $p = s^{\gamma}/(s^{\gamma} + s^{*\gamma})$ used by Dietl et al. (2008) could give either a concave or a convex performance function, depending on the value of γ.

and a three-year weighted average of previous annual performances, with a gradual decline in importance of results. Table 1 gives the twenty national teams with the highest number of FIFA points in February 2010.

In order to quantify the effect of migrating players' skill acquisitions, we construct a migration index that takes into account the strength of the league and the division of the club to which national team players migrated.

As mentioned in the introduction, the literature has used the percentage of migrating players as a measure of the migration rate (Gelade and Dobson, 2007; Frick, 2009). However, this index does not take into account the fact that some players migrate to average foreign leagues, where the quality of training is only slightly better than what they could obtain at home, while other players migrate to top European leagues, where the quality of training is the best in the world. A player migrating to a club in a higher quality league will acquire better skills, so he should get a higher weight in the migration index.

We collected data on the club of employment for the players of all national teams. For confederations organizing confederation championships, we use the squad compositions during those championships.[9] For AFC countries we use the 2007 AFC Asian Cup squads, for CAF countries, we use the 2008 Africa Cup of Nations squads, for CONCACAF countries we use the 2007 CONCACAF Gold Cup squads, for CONMEBOL countries we use the 2007 Copa América squads and for UEFA countries we use the UEFA Euro 2008 squads. The OFC Nations Cup is organized for OFC countries, but squad compositions of this championship were not

[9] There are six football confederations; the Asian Football Confederation (AFC), the Confédération Africaine de Football (CAF), the Confederation of North Central American and Carribean Association Football (CONCACAF), the Confederación Sudamericana de Fútbol (CONMEBOL), the Oceania Football Confederation (OFC) and the Union des Associations Européennes de Football (UEFA), currently consisting of respectively 46, 52, 35, 10, 11 and 53 football nations.

available. Data on the national squads for non participating countries were taken from http://www.national-football-teams.com/v2/national.php.

Note that we use 2010 data for team performance and 2007 or 2008 data for national squad composition. The reason for using lagged data for the squad composition is that players who have emigrated only recently are unlikely to contribute with newly acquired skills to the performance of their national squads, since acquiring skills is a process that takes time (FIFA, 2006).

We attach the following migration index to each national team:

$$Migr = \frac{1}{n}\sum_i r_i \sum_d \frac{1}{d} n_{id}, \tag{10}$$

where n is the total number of players in the national squad, n_{id} is the number of players that migrated towards a division d club in UEFA league i, and r_i is the relative UEFA ranking of league i. This index assigns a higher weight to players migrating to stronger leagues and to higher divisions.

Note that only national team players migrating to UEFA leagues are computed in our migration index. This is not an important restriction, given that in the African continent, which is the confederation with the highest number of migrating players towards another confederation than UEFA, only around 30 out of almost 500 migrating players were not playing in UEFA countries.

The UEFA ranking of league i is the ranking associated with the sum of the five UEFA coefficients of the last five years. The UEFA coefficients are calculated based on the performance of club teams in the main European club competitions, the Champions League and the Europa League. In general, each participating team gets two points for a win, one point for a draw and some bonus points for proceeding further in the tournament. The UEFA coefficient assigned to a country is the sum of points obtained by all the participating teams from that country divided by the number of those teams. The data is taken from http://www.xs4all.nl/~kassiesa/bert/uefa.

In order to get rid of the inverse relationship between UEFA ranking and performance, we assign the following relative ranking to league i (Barajas et al., 2005):

$$r_i = (n_{UEFA} + 1 - p_{rank,i})/n_{UEFA}, \tag{11}$$

where n_{UEFA} is the number of UEFA countries and $p_{rank,i}$ is the position of league i in the UEFA ranking.

Our migration index takes values between 0 (no player was playing in a foreign UEFA league) and 1 (all players were playing in highest ranked foreign UEFA league). Table 2 provides the twenty national squads with the highest migration index. Table 3 provides the twenty national squads with a zero migration index in our sample, with the exclusion of the Oceanic and Asian confederation countries.[10]

We control for a number of explanatory variables, in line with the literature on international football performance. Following Hoffmann et al. (2002), Houston and Wilson (2002) and Torgler (2006), we include GDP per capita and its quadratic form as control variables.[11] Individuals living in wealthier countries are more likely to participate in leisure activities and subsequently in competitive sports. Furthermore, wealthier countries have more resources to spend on health care, training facilities and other productivity enhancing inputs. One

[10] Only the Oceanic confederation squad of New Zealand and the Asian confederation squads of Afghanistan, Australia, Iran, Iraq, Japan, Jordan, Korea DPR, Korea Republic, Lebanon, Oman, Pakistan, Philippines, Syria, Thailand, Turkmenistan and Uzbekistan had players migrating to UEFA leagues in our sample.

[11] Since football is an inexpensive sport compared to other sports, poorer people might be overinvesting in it. Moreover, if income increases, not only other outdoor sports will act as substitutes for football but also indoor activities such as video and DVD games.

expects a positive relationship between income and international football performance. Data on GDP per capita is taken from the International Monetary Fund World Economic Outlook 2009.

We control for countries' population size and its quadratic term, as a proxy for the pool of talent. We use population data for the year 2009, from the CIA World Fact Book.

Countries with a longer football history are likely to perform better in international competitions. In line with the existing literature, we use the year of foundation of the national football association to measure football history.[12] This data has also been gathered from http://www.national-football-teams.com/v2/national.php.

Next, a temperature variable is introduced to take into account the effect of climate on football performance. Following earlier contributions (Hoffmann et al., 2002; Macmillan and Smith, 2007), we measure temperature by the squared deviation of average annual temperatures from 14° C in the capital city. The coefficient of this variable is expected to be negative.

Finally, we control for historical performance in international football competitions. Following previous literature (Houston and Wilson, 2002; Yamamura, 2008, 2009), we use the number of World Cup appearances as measure of historical performance.[13]

Our dataset includes 190 countries.[14] Table 4 provides the descriptive statistics.

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[12] Since some former members of socialist political entities like the Soviet Union, Yugoslavia and Czechoslovakia have relatively recent foundations, but presumably a football tradition dating back to the affiliation with those former entitities, we substituted the year of foundation of the national football association by the year of absorption into the respective entity for those countries for which foundation was only after the dissolution of the large entity and if a national football association of this larger entity had been founded before. A similar approach is undertaken in Gelade and Dobson (2007), while others (Macmillan and Smith, 2007; Leeds and Leeds, 2009) try to overcome this problem by including dummies for former republic or communist members.

[13] We do not include 2006 and 2010 World Cup appearances in order to avoid endogeneity.

[14] Significant outlier behavior was detected for the effect of population size for China and India and for the effect of GDP per capita for Liechtenstein, Qatar, Bermuda and Luxembourg, so these countries were excluded from the regressions. No data on GDP per capita was available for Montserrat and Tahiti and data on national squad composition was insufficient for the Central African Republic, Eritrea, Papua New Guinea and British Virgin Islands, so these countries are also excluded from the regressions. Moreover, we exclude the strongest European leagues England, Spain, Italy, Germany and France (Big Five leagues) since the migration index for these countries does not measure skill acquisition effects.

3.2. Empirical Specification

We estimate the following equation:

$$Points_i = \beta_0 + \beta_1 Migr_i + \beta_2 Migr_i^2 + \beta_3 GDP_i + \beta_4 GDP_i^2 + \beta_5 Pop_i + \beta_6 Pop_i^2 + \beta_7 Temp_i + \beta_8 Hist_i + \beta_9 WCApp_i + u_i, \quad (12)$$

where $Points_i$ is the number of FIFA points for country i, $Migr_i$ is the migration index, GDP_i is GDP per capita, Pop_i is the population size, $Temp_i$ is the temperature variable, $Hist_i$ is football history, $WCApp_i$ is historical performance and u_i is an error term.

We include both a linear and a quadratic form of the migration index in order to test for decreasing returns to migrations, as predicted by the theoretical model.

This equation is estimated using ordinary least squares. The results are discussed in the following sections.

3.3. Regression Results

Table 5 reports estimation results for different specifications based on model (12). The unconditional specification in column (1) yields statistically significant migration coefficients for both the linear and the quadratic term. The positive sign for the linear term and the negative sign for the quadratic term are consistent with our hypothesis of decreasing returns to migration.

In columns (2)-(6) we report regression results including the control variables described in section 3.1. In columns (2) and (3), we control for income per capita and population size. In line with previous studies, we find positive and significant coefficients for these two variables and negative and significant coefficients for their squared terms. Controlling for these two variables increases the significance of the quadratic migration term. Regressions (4), (5) and (6) respectively add football history, temperature and historical performance as control variables. The signs and significance of these coefficients also confirm findings of previous studies.

These empirical findings support the theoretical prediction of a positive effect of migration on international football performance. The coefficient of the migration index is positive and significant at the 1% level in all specifications. We also find support for the theoretical prediction of decreasing returns to migration. The coefficient of the squared migration index is negative and significant in all specifications, except for column (5).

The final specification in column (6) suggests that holding other factors constant, a 1 percentage point increase in the migration index raises FIFA points on average by 7.725 points for a country with an average migration level. The population of a typical country should increase with around 2.979 million inhabitants to generate approximately the same result ceteris paribus. More specifically, our estimations suggest that a developing country like Ghana, with a migration index equal to 0.637 (see Table 1), can increase its FIFA points by 32.226 points if its index increases by 10 percentage points. This could be obtained if, for example, three additional players of the Ghanaian national team migrated to a second rated UEFA league like Belgium.

3.4. Extensions and Robustness Checks

In this section, we consider extensions and robustness checks of our basic model.

Our first robustness check is the use of the FIFA ranking as an alternative measure of international football performance. Note that the use of the ranking instead of the points leads to a loss of information on the variation in performance between nations.

We estimate the following equation:

$$Ranking_i = \beta_0 + \beta_1 Migr_i + \beta_2 Migr_i^2 + \beta_3 GDP_i + \beta_4 GDP_i^2 + \beta_5 Pop_i + \beta_6 Pop_i^2 + \beta_7 Hist_i + \beta_8 Temp_i + \beta_9 WCApp_i + u_i. \quad (13)$$

Since ranking is a count variable, the appropriate estimation technique for this equation is a Poisson regression. However, due to excess dispersion of the rank variable, we estimate (13) using negative binomial regression.

The results of this regression are given in Table 6. The positive effect of migration on national team performance is confirmed in all specifications (1)-(6). The prediction of decreasing returns to migration is not confirmed.

The estimated migration coefficient drops significantly when we control for historical performance in column (6). This can be explained by the fact that the migration index may be correlated to historical performance. Countries that previously participated in the World Cup may attract more attention from foreign talent scouts and their players could more likely obtain contracts in foreign clubs.

Including confederation dummies to models (12) and (13) and including the outliers in the sample does not change the results, nor the explanatory power of the regressions.[15]

Our second robustness check aims at insuring that the estimated effect of migration on international football performance is driven by countries with small football markets, as predicted by the theoretical model. We address this issue in two ways. First, we include an interaction term between a dummy variable for UEFA countries and the migration index. We expect this interaction term to be negative since migration should be more valuable for confederations with smaller football markets. Second, we exclude UEFA countries from our sample.

[15] The results of these regressions are available upon request.

Regression results including the interaction term between the UEFA dummy and the migration index are presented in Table 7. The linear migration variable is significant at the 1% level in both columns (1) and (2), while the quadratic migration variable is only significant in column (1), when performance is measured by the number of FIFA points. The negative and significant estimated coefficients of the interaction term indicate that migration towards UEFA leagues is more valuable for non-UEFA countries. These additional results are broadly in line with our theoretical framework.

The results excluding UEFA countries are reported in Table 8. The coefficient of the migration index remains positive and significant at the 1% level, but the squared migration index loses its significance. More importantly, the coefficient of the migration index is higher than in the estimations using the whole sample (column (6) of Tables 5 and 6). This result is also consistent with the theoretical prediction that the skill acquisition effect should be more important for countries with smaller football markets.

A third robustness check deals with the countries in the sample that have a zero migration index (see above). Since these countries are numerous, we should check whether they drive our results. The estimation results excluding those countries are shown in Table 9. The positive effect of migration on national team performance is again confirmed in columns (1) and (2). As expected, the estimated coefficients of the linear migration term decrease in magnitude since countries with low migration and bad national team performance are excluded.

A final robustness check deals with the players that had once migrated to a UEFA league, but returned to their home leagues in 2007 or 2008. These players acquired skills during their UEFA experience, but are not included in our migration index. Including these earlier migration patterns in the migration index should increase the value of its estimated coefficient. Table 10 reports the regression results when the migration index includes returned players. In line with the expectations, the migration coefficient is higher.

A final issue one can be concerned about is the endogeneity of our migration index. If a country has more talented players, these players will be more able to migrate to strong leagues. Consequently, this country will have a higher migration index, but also a better performing national team. As we cannot directly control for players' talent, there could be an omitted variable problem that could bias upwards the coefficient of our migration index. However, we think that population size and football culture, which we control for, are a fair proxy for a country's pool of football talent. Moreover, the fact that a player currently plays in the highly ranked UEFA league captures the experience effect of playing firstly in lower European leagues, since most players do not migrate directly from their home domestic league to the strongest European leagues. In the sports literature, there are numerous articles emphasizing that lower rated European leagues acts as "nursery hubs" (Andreff, 2009) or as "transition countries for potential top players" (Dejonghe, 2001). Hence, if the quality of the league is also a proxy for the time that the player has spent training in particular European leagues, then a high migration index signals a longer football experience acquired abroad.

Another potential source of endogeneity is the possibility that well managed national football federations are more likely to obtain good results for the national team, but also to promote the migration of players. If this is the case, our estimations could be biased by an omitted variable problem. To investigate this potential endogeneity problem, we compare 2010 data, when restrictions on football player migrations were very low, with 1994 data, when restrictions on football player migrations were very high. We restrict the sample to African countries, in order to focus on small football markets.

We estimate the following equation[16]:

$$\Delta Ranking_{i,2010-1994} = \beta_0 + \beta_1 \Delta Migr_{i,2010-1994} + \beta_2 \Delta GDP_{i,2010-1994} + \beta_3 \Delta Pop_{i,2010-1994} + \beta_4 Hist_i + u_i. \quad (14)$$

Equation (14) is estimated using ordinary least squares.

Table 11 reports the results. In all columns (1)-(4), migration has a positive and significant influence on the evolution of national team performance between 1994 and 2010. In line with Ruiz and Fadal (2010), we find that the size of the economy is the only other significant driver of African football performance. The final specification (4) suggests that a one percentage point increase in the migration index increases the evolution of the FIFA ranking between 1994 and 2010 with 0.285 percentage points ceteris paribus.

To sum up, we have found strong and robust empirical support for the theoretical prediction that football players' migration improves the performance of national teams for countries with small football markets. We have found some support, although less robust, for the prediction of decreasing returns to migrations on national team performance.

[16] The temperature variable is excluded from this regression since we focus on the African continent and the World Cup appearances variable is excluded since differences in World Cup appearances cancel out.

4. Conclusion

We investigated the effect of outward migration of football players on the performance of their home countries' national teams. We built a simple theoretical framework predicting a positive effect of players' migration rate on national team performance. This positive effect is due to the superior skills that migrating players acquire in foreign clubs and that they take back with them when representing their national team. We used cross country data on national team performance and on the club of employment of national team players to test this prediction. We quantified the effect of skill acquisitions abroad by computing, for each national team, a migration index that weights each migrant player with the strength of the foreign league where he is training.

After controlling for wealth, population, climate, football history and historical performance, we find significant and robust support for the prediction of a positive effect of migration on international football performance. This evidence suggests that while developing countries' football clubs may experience a "muscle drain", their national teams experience a "muscle gain" at the same time.

These optimistic results on the impact of migration on international football performance through skill spillovers cannot be easily generalized to other sectors than sports, where temporary return of migrants is less systematic. However, the experience of football players could serve as an example for other professionals willing to do something for their origin countries. Policy makers willing to increase the development impact of international migrations could try to design programs that facilitate temporary return of skilled professionals who are willing to work in their origin country for short periods of time. Some projects of this type have already been initiated. For example, the International Organization for Migration has recently launched a program that finances short term working visits of expatriated Moldovan scientists to an academic institution in their origin country. The aim of these visits is to facilitate skill-spillovers and scientific collaboration between Moldovan and foreign academic institutions. Analyzing the impact temporary return of migrants in other sectors than sports could be an interesting direction for future research.

References

Adams, R.H.J. (2003). International Migration, Remittances, and the Brain Drain. A Study of 24 Labor-Exporting Countries. *Policy Research Working Paper No. 3069*. The World Bank, Poverty Reduction Group, Washington, DC.

Andreff, W. (2004). The Taxation Of Player Moves From Developing Countries. In R. Fort & J. Fizel (Eds.), *International Sports Economic Comparisons* (pp. 87-103). Westport and London: Praeger.

Andreff, W. (2006). Pistes de réflexion économique. In D. Oswald (Ed.), *La nationalité dans le sport. Enjeux et problèmes* (pp.171-191). Neuchâtel: CIES, Université de Neuchâtel.

Andreff, W. (2009). The Economic Effects of 'Muscle Drain' in Sport. In G. Walters & G. Rossi (Eds.), *Labour Market Migration in European Football: Key Issues and Challenges* (pp. 9-31). Birbeck, University of London.

Antonioni, P., & Cubbin, J. (2000). The Bosman Ruling and the Emergence of a Single Market in Soccer Talent. *European Journal of Law and Economics, 9*(2), 157-173.

Barajas, A., Fernández-Jardón, C., & Crolley, L. (2005). Does sports performance influence revenues and economic results in Spanish football?. *Working Paper No. 3234*. Munich Personal RePEc Archive, Munich.

Baur, D., & Lehmann, S. (2007). Does the Mobility of Football Players Influence the Success of the National Team?. *Discussion Paper No. 217*. Institute for International Integration Studies, Dublin.

Beine, M., C. Defoort and F. Docquier (2007). A Panel Data Analysis of The Brain Gain, IRES *Discussion Paper, 2007-27*, Université Catholique de Louvain.

Beine, M., F. Docquier and H. Rapoport (2008). Brain drain and human capital formation in developing countries: winners and losers, *Economic Journal*, 118, 631-652.

Beine, M., F. Docquier and H. Rapoport (2009). On the robustness of brain gain estimates, *Working Paper*, Bar-Ilan University.

Binder, J.J., & Findlay, M. (2009). The Effects of the Bosman Ruling on National and Club Teams in Europe. *Working Paper*. University of Illinois, Chicago.

Borjas, G.J. (1989). Economic Theory and International Migration. *International Migration Review*, *23*(3), 457-485.

Boucher, S., Stark, O., & Taylor, J.E. (2005). A Gain with a Drain? Evidence from Rural Mexico on the New Economics of the Brain Drain. *Working Paper No. 05*. Department of Agricultural and Resource Economics, California.

Chaix, P. (2004). *Le rugby professionnel en France. Enjeux économiques et sociaux.* Paris: L'Harmattan.

Darby, P. (2007a). African Football Labour Migration to Portugal: Colonial and Neo-Colonial Resource. *Soccer & Society, 8*(4), 495-509.

Darby, P. (2007b). Out of Africa: The Exodus of African Football Talent to Europe. *WorkingUSA: The Journal of Labour and Society*, *10*(4), 443-456.

Darby, P., Akindes, G., & Kirwin, M. (2007). Football Academies and the Migration of African Football Labor to Europe. *Journal of Sport & Social Issues, 31*(2), 143-161.

Dejonghe, T. (2001). The place of Sub-Sahara Africa in the worldsportsystem. *Afrika Focus, 17*(1), 79-111.

Dietl, H.M., Franck, E., & Lang, M. (2008). Overinvestment in Team Sports Leagues: A Contest Theory Model. *Scottish Journal of Political Economy, 55*(3), 353-368.

Docquier, F. and H. Rapoport, (2010). The Economics of the Brain Drain, *Working paper*.

Ericson, T. (2000). The Bosman case: Effects of the Abolition of the Transfer Fee. *Journal of Sports Economics, 1*(3), 203-218.

Faini, R. (2007). Remittances and the brain drain, *World Bank Economic Review*, 21(2), 177-191.

Feess, E., & Muehlheusser, G. (2003). Transfer Fee Regulations in European Football. *European Economic Review, 47*(4), 645-668.

FIFA (2006). Benni McCarthy: For club and country. Article available at http://www.fifa.com, 10 December 2006.

Frick, B. (2009). Globalization and Factor Mobility: The Impact of the "Bosman-Ruling" on Player Migration in Professional Soccer. *Journal of Sports Economics, 10*(1), 88-106.

Gelade, G.A., & Dobson, P. (2007). Predicting the Comparative Strengths of National Football Teams. *Social Science Quarterly, 88*(1), 244-258.

Gerrard, B. (2002). The Muscle Drain, Coubertobin-Type Taxes and the International Transfer System in Association Football. *European Sport Management Quarterly, 2*(1), 47-56.

Gibson, J. and D. McKenzie (2010). The Economic Consequences of "Brain Drain" of Best and Brightest: Microeconomic Evidence from Five Countries. *IZA Discussion Paper* No. 5124.

Hoffmann, R., Lee, C.G., & Ramasamy, B. (2002). The Socio-Economic Determinants of International Soccer Performance. *Journal of Applied Economics, 5*(2), 253-272.

Houston, R.G., & Wilson, D.P. (2002). Income, Leisure and Proficiency: An Economic Study of Football Performance. *Applied Economic Letters, 9*(14), 939-943.

Kesenne, S. (2007). The Peculiar International Economics of Professional Football in Europe. *Scottish Journal of Political Economy, 54*(3), 388-399.

Leeds, M.A., & Leeds, E.M. (2009). International Soccer Success and National Institutions. *Journal of Sports Economics, 10*(4), 369-390.

Luiz, J.M., & Fadal, R. (2010). An Economic Analysis of Sports Performance in Africa. *Working Paper No. 162*. Wits Business School, Witwatersrand.

Macmillan, P., & Smith, I. (2007). Explaining International Soccer Rankings. *Journal of Sports Economics, 8*(2), 202-213.

Magee, J., & Sugden, J. (2002). "The World at their Feet": Professional Football and International Labor Migration. *Journal of Sport & Social Issues, 26*(4), 421-437.

Milanovic, B. (2005). Globalization and goals: Does soccer show the way? *Review of International Political Economy, 12*(5), 829-850.

Niimi, Y., C. Özden and M. Schiff (2008). Remittances and the brain drain: skilled migrants do remit less! *Working Paper*, World Bank.

Nyarko, Y. (2011). The Returns to the Brain Drain and Brain Circulation in sub Saharan Africa: some Computations using data from Ghana. *NBER Working Paper* 16813.

Özden, C., & Schiff, M. (2005). *International Migration, Remittances and the Brain Drain*. New York: Palgrave MacMillan and World Bank.

Penn, D.W. (2006). From Bosman to Simutenkov: the application of non-discrimination principles to non-EU nationals in European sports. *Suffolk Transnational Law Review, 30*(1), 203-231.

Poli, R. (2006). Migrations and trade of African football players: historic, geographical and cultural aspects. *Afrika Spectrum, 41*(3), 393-414.

Poli, R. (2008). Explaining the "muscle drain" of African football players: world-system theory and beyond. *Working paper No. 01*. Basler Afrika Bibliographien, Basel.

Simmons, R. (1997). Implications of the Bosman ruling for football transfer markets. *Economic Affairs, 17*(3), 13-18.

Stark, O. (2004). Rethinking the Brain Drain. *World Development, 32*(1), 15-22.

Swinnen, J.F.M., & Vandemoortele, T. (2009). Sport en ontwikkeling: een economische visie op de impact van de Wereldbeker 2010 in Zuid-Afrika. In J. Scheerder & B. Meulders (Eds.), *Wedijver in een international arena. Sport, bestuur & macht* (pp. 185-205). Ghent: Academia Press.

Szymanski, S. (1999). The market for soccer players in England after Bosman: winners and losers. In C. Jeanrenaud & S. Kesenne (Eds.), *Competition Policy in Professional Sports: Europe after the Bosman Case* (pp. 133-160). Antwerp: Standard Editions.

Torgler, B. (2006). ‘Historical Excellence’ in Soccer World Cup Tournaments: Empirical Evidence with Data from 1930 to 2002. *Rivista di Diritto ed Economia dello Sport*, *2*(1),101-117.

Yamamura, E. (2008). Effect of Linguistic Heterogeneity on Technology Transfer: An Economic Study of FIFA Football Rankings. *Working paper No. 10305*. Munich Personal RePEc Archive, Munich.

Yamamura, E. (2009). Technology transfer and convergence of performance: an economic study of FIFA football ranking. *Applied Economic Letters*, *16*(3), 261-266.

Appendix

Table 1: Twenty national football teams with highest FIFA points in February 2010

Country	Points
Spain	1627
Brazil	1568
Netherlands	1288
Italy	1209
Portugal	1176
Germany	1173
France	1117
Argentina	1082
England	1076
Egypt	1069
Croatia	1053
Greece	1030
Russia	1026
USA	963
Nigeria	956
Chile	955
Mexico	947
Switzerland	924
Serbia	916
Cameroon	914

Source: FIFA.

Table 2: Twenty national football teams with highest migration index

Country	Migration index
Côte d'Ivoire	0.922
Republic of Ireland	0.833
Czech Republic	0.828
Senegal	0.823
Brazil	0.809
Nigeria	0.803
Cameroon	0.75
Croatia	0.726
Switzerland	0.687
Sweden	0.661
Australia	0.657
Ghana	0.637
Argentina	0.618
Northern Ireland	0.617
Serbia	0.606
Uruguay	0.599
Netherlands	0.589
Mali	0.588
Montenegro	0.587
Slovakia	0.585

Table 3: Twenty national football teams with zero migration index, excluding Oceanic and Asian confederation countries

Country	Migration index
Botswana	0
Comoros	0
Ethiopia	0
Lesotho	0
Seychelles	0
Sudan	0
Swaziland	0
Tanzania	0
Aruba	0
Belize	0
Cuba	0
El Salvador	0
Guatemala	0
Nicaragua	0
Puerto Rico	0
St. Lucia	0
St. Vincent and the Grenadines	0
Suriname	0
Turks and Caicos Islands	0
US Virgin Islands	0

Notes: (i) See text for Oceanic and Asian confederation.

Table 4: Descriptive statistics

Variables	Mean	Max.	Min.	Std. Dev.
FIFA points	378.921	1568	0	320.993
Migration index	0.204	0.922	0	0.237
GDP per capita (in 1,000$)	13.285	53.269	0.009	13.249
Population (in 1,000,000 inhabitants)	20.818	307.212	0.012	41.577
Football history	1939.326	2002	1873	27.294
Temperature	83.821	256	0	68.641
Historical performance	1.432	17	0	2.935

Notes: (i) See text for variables description.

Table 5: Determinants of international football performance measured by FIFA points

Dependent variable	FIFA points					
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Constant	159.855	91	-7.63	4296.92	3813.691	2358.646
	(0.000)	*(0.000)*	*(0.782)*	*(0.000)*	*(0.001)*	*(0.019)*
Migration	**1390.138**	**1323.701**	**1317.621**	**1155.419**	**1032.881**	**962.6**
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Migration²	**-660.940**	**-606.356**	**-663.132**	**-508.075**	-377.991	**-466.043**
	(0.069)	*(0.086)*	*(0.017)*	*(0.055)*	*(0.163)*	*(0.081)*
GDP per capita		10.875	14.267	10.599	9.749	6.55
		(0.008)	*(0.000)*	*(0.003)*	*(0.006)*	*(0.054)*
(GDP per capita)²		-0.192	-0.234	-0.181	-0.167	-0.111
		(0.046)	*(0.008)*	*(0.025)*	*(0.04)*	*(0.146)*
Population			5.185	4.573	4.284	3.437
			(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
Population²			-0.015	-0.013	-0.012	-0.011
			(0.001)	*(0.002)*	*(0.003)*	*(0.005)*
Football history				-2.191	-1.905	-1.152
				(0.000)	*(0.001)*	*(0.026)*
Temperature					-0.566	-0.42
					(0.006)	*(0.028)*
Historical performance						29.399
						(0.000)
Observations	190	190	190	190	190	190
Adjusted R²	0.51	0.528	0.627	0.652	0.662	0.7

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold.

Table 6: Determinants of international football performance measured by FIFA ranking

Dependent variable	FIFA ranking					
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.981	5.127	5.336	-3.889	-2.879	0.27
	(0.000)	*(0.000)*	*(0.000)*	*(0.098)*	*(0.244)*	*(0.901)*
Migration	**-2.568**	**-2.518**	**-2.529**	**-2.197**	**-1.956**	**-1.696**
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Migration²	0.788	0.756	0.803	0.495	0.261	0.398
	(0.371)	*(0.36)*	*(0.266)*	*(0.466)*	*(0.702)*	*(0.538)*
GDP per capita		-0.022	-0.032	-0.023	-0.021	-0.013
		(0.012)	*(0.000)*	*(0.004)*	*(0.008)*	*(0.081)*
(GDP per capita)²		0.000	0.001	0.000	0.000	0.000
		(0.075)	*(0.01)*	*(0.036)*	*(0.05)*	*(0.165)*
Population			-0.011	-0.009	-0.008	-0.007
			(0.000)	*(0.002)*	*(0.002)*	*(0.004)*
Population²			0.000	0.000	0.000	0.000
			(0.05)	*(0.09)*	*(0.026)*	*(0.102)*
Football history				0.005	0.004	0.002
				(0.000)	*(0.003)*	*(0.028)*
Temperature					0.001	0.001
					(0.005)	*(0.024)*
Historical performance						-0.081
						(0.000)
Observations	190	190	190	190	190	190
Adjusted R^2	0.509	0.502	0.563	0.612	0.624	0.682

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: negative binomial. (iii) Significant variables of interest in bold.

Table 7: Determinants of international football performance, including an interaction term between UEFA countries and the migration index

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
Constant		3052.091	-1.583
		(0.003)	*(0.451)*
Migration		**1048.283**	**-1.963**
		(0.000)	*(0.000)*
Migration²		**-450.156**	0.369
		(0.076)	*(0.578)*
GDP per capita		8.421	-0.018
		(0.015)	*(0.014)*
(GDP per capita)²		-0.139	0.000
		(0.075)	*(0.062)*
Population		3.135	-0.006
		(0.001)	*(0.006)*
Population²		-0.01	0.000
		(0.004)	*(0.085)*
Football history		-1.508	0.003
		(0.004)	*(0.002)*
Temperature		-0.53	0.001
		(0.006)	*(0.003)*
Historical performance		28.467	-0.082
		(0.000)	*(0.000)*
*UEFA*migration*		-222.176	0.669
		(0.029)	*(0.008)*
Observations		190	190
Adjusted R^2		0.722	0.683

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 8: Determinants of international football performance, excluding UEFA countries

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
Constant		2789.128	-0.773
		(0.003)	*(0.689)*
Migration		**1010.928**	**-1.813**
		(0.000)	*(0.000)*
Migration²		-449.419	0.447
		(0.162)	*(0.601)*
GDP per capita		5.673	-0.01
		(0.081)	*(0.105)*
(GDP per capita)²		-0.077	0.000
		(0.285)	*(0.363)*
Population		2.166	-0.004
		(0.014)	*(0.034)*
Population²		-0.008	0.000
		(0.021)	*(0.102)*
Football history		-1.363	0.003
		(0.005)	*(0.003)*
Temperature		-0.504	0.001
		(0.007)	*(0.006)*
Historical performance		39.733	-0.136
		(0.000)	*(0.000)*
Observations		144	144
Adjusted R^2		0.741	0.686

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 9: Determinants of international football performance, excluding UEFA countries and countries with a zero migration index

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
Constant		3077.582	-1.105
		(0.041)	*(0.711)*
Migration		**717.978**	**-1.319**
		(0.015)	*(0.039)*
Migration²		-111.474	-0.128
		(0.775)	*(0.897)*
GDP per capita		3.982	-0.007
		(0.558)	*(0.585)*
(GDP per capita)²		0.004	-0.000
		(0.984)	*(0.864)*
Population		1.971	-0.003
		(0.123)	*(0.197)*
Population²		-0.007	0.000
		(0.11)	*(0.265)*
Football history		-1.477	0.003
		(0.055)	*(0.043)*
Temperature		-0.652	0.001
		(0.022)	*(0.017)*
Historical performance		37.656	-0.13
		(0.000)	*(0.000)*
Observations		91	91
Adjusted R^2		0.678	0.6

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 10: Determinants of international football performance, including former migrants who returned home

Variables	Dependent variable	FIFA points (1)	FIFA ranking (2)
Constant		1920.257	1.148
		(0.056)	*(0.601)*
Migration		**1049.559**	**-1.944**
		(0.000)	*(0.000)*
Migration²		**-551.17**	-0.716
		(0.027)	*(0.266)*
GDP per capita		6.994	-0.014
		(0.028)	*(0.046)*
(GDP per capita)²		-0.133	0.000
		(0.06)	*(0.077)*
Population		3.337	-0.007
		(0.000)	*(0.003)*
Population²		-0.01	0.000
		(0.004)	*(0.106)*
Football history		-0.943	0.002
		(0.067)	*(0.072)*
Temperature		-0.298	0.001
		(0.107)	*(0.073)*
Historical performance		28.208	-0.076
		(0.000)	*(0.000)*
Observations		190	190
Adjusted R^2		0.72	0.701

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method column (1): ordinary least squares, estimation method column (2): negative binomial. (iii) Significant variables of interest in bold.

Table 11: Determinants of the variation in international football performance between 1994 and 2010; restricted sample of African countries

Dependent variable	Difference in FIFA ranking			
Variables	(1)	(2)	(3)	(4)
Constant	0.034	-0.018	-0.003	-1.963
	(0.362)	*(0.679)*	*(0.955)*	*(0.62)*
Difference in migration	**0.275**	**0.311**	**0.309**	**0.285**
	(0.079)	*(0.043)*	*(0.044)*	*(0.084)*
Difference in GDP per capita		0.015	0.014	0.012
		(0.013)	*(0.034)*	*(0.09)*
Difference in population			-0.002	-0.001
			(0.364)	*(0.577)*
Football history				0.001
				(0.622)
Observations	44	44	44	44
Adjusted R^2	0.038	0.09	0.074	0.055

Notes: (i) In parentheses p-values based on standard errors robust to heteroskedasticity. (ii) Estimation method: ordinary least squares. (iii) Significant variables of interest in bold. (iv) Not all African countries are included due to data limitations regarding FIFA ranking and national squad compositions. (v) FIFA rankings are calculated according to formula (11) in order to account for the increase in the number of FIFA members between 1994 and 2010.